Pit and Quarry

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Next Issue March 13, 1929

Electric Power gives lower operating cost.

Where electric power is available at reasonable cost, owners find that electric shovels make considerable savings. Lower costs for power, labor; steadier production.

Tough work here—bucking through granite

You can see what this 50-B BUCYRUS-ERIE Electric is up against, nosing into some of the hardest granite digging you'll find anywhere. It blasts out in good-sized chunks.

In this quarry of the Carolina Road Granite Co. at Elm City, N. C., the BUCYRUS-ERIE 50-B is giving a steady production, day in and day out.

"Do not believe any other machine could even compete with it"—

writes one quarryman who has a BUCYRUS-ERIE 50-B Electric, and in these words he sums up the experience of many other owners.

Watch a 50-B electric in action—you'll be impressed by its smoothness and speed in handling rock.

Then climb up on the cab, and note the absolute ease with which the operator puts this machine through its paces. And size up for yourself the unequalled simplicity of this heavy-duty shovel. The neat, clean cut appearance of this machine goes a long way to explain its Reliability.

If you have electric current available at a reasonable rate, write us for some time studies of BUCYRUS-ERIE Electrics—they'll be of particular interest to you. Tell us about the loading conditions in your quarry.

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MEN OF THE INDUSTRY

The portraits printed on this page in each number of PIT and QUARRY are taken from our files and their selection is without significance as to current events or as to the position of the individual in the industry.

Edwin P. Lucas

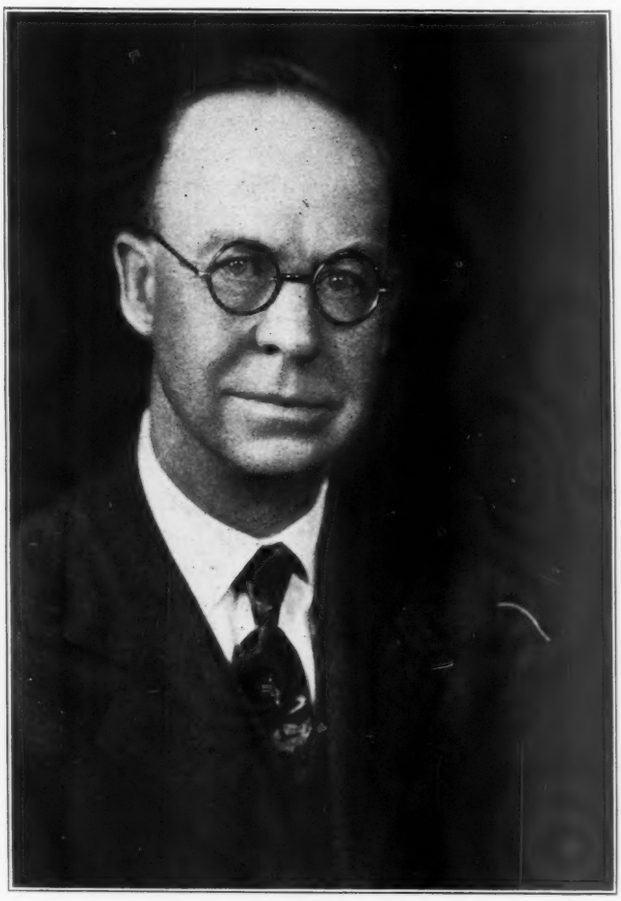
Mr. Lucas is the Recently Elected President
of the Superior Portland Cement Company, Inc., of Seattle, Washington

Pit and Quarry Has New Editor

THE PUBLISHERS of PIT AND QUARRY are pleased to announce the acceptance of its editorship by Mr. Arthur J. Hoskin.

A Badger by birth, Mr. Hoskin spent most of his boyhood in Milwaukee. In 1890 he graduated from the course in mechanical engineering at the University of Wisconsin. Fifteen years later, after extensive experience and responsible connections, he was granted the professional engineering degree by his alma mater.

His activities have been, almost exclusively, in the industries based upon minerals and mining, and they have extended over the continent from Alaska to Mexico and from coast to coast. He has had close contacts with the production and processing of non-metallic, metallic and bituminous minerals in many fields.



Arthur J. Hoskin

For several years, Mr. Hoskin was professor of mining engineering and head of that department in the Colorado School of Mines, at Golden. Later he held similar offices in the University of Illinois, at Urbana. He comes to PIT AND QUARRY directly from Purdue University at Lafayette, Ind., where he has conducted researches, and has taught mineralogy and engineering geology.

He has examined and has prepared professional geological reports on many deposits and structures, and is co-author of two large bulletins published by the Colorado Geological Survey. His private practice has included reports on petroleum prospects. For about fifteen years he held a commission from the federal land office as a United States mineral surveyor, and he has conducted investigations and rendered reports on mineral properties under instructions from the Securities Commission for the State of Illinois.

His engineering experience has included the design, erection and operation of mining and milling plants. He is familiar with details of plant equipment. His acquaintance with open-pit work dates from his boyhood when his father operated a limestone quarry in Wisconsin.

At intervals he engaged exclusively in editorial work, either as editor or as a special correspondent for well-known periodicals. He was editor of Mining and Metallurgical Journal and of Mining American, western editor of Mines and Minerals, and special correspondent over long periods for Mining and Scientific Press and for Engineering and Mining Journal. During periods when not connected with journals he has been a frequent contributor to them.

Among his writings are bulletins published by the Engineering Experiment Station of the University of Illinois, upon such subjects as underground haulage, skip-hoisting, and the distribution of power consumption in Illinois coal mining. Recently the Engineering Experiment Station of Purdue University published his bulletin upon the spontaneous combustion of storage coal, a subject of real significance to many readers of PIT AND QUARRY.

If Mr. Hoskin has had a hobby it has been his long time, researchful study of American oil-shales—non-metallic natural resources that are destined probably to form the basis of a huge industry in the manufacture of motor fuel.

He has membership in the American Institute of Mining and Metallurgical Engineers, the Western Society of Engineers, and the Coal Mining Institute of America, and was formerly secretary of the Colorado Scientific Society. He belongs to the national, honorary, scientific-research society known as Sigma Xi, and to Delta Upsilon. His biography appears in practically every Who's Who.

Mr. Hoskin anticipates with pleasure his meeting with men of the industry, and we are sure of his ambition to serve them through his personal efforts as well as through the columns of PIT AND QUARRY.

THE PUBLISHERS.

Why We Use Three Different Methods Of Drilling and Blasting Trap Rock

By F. H. EDWARDS*
The Connecticut Quarries Company, New Haven, Conn.

TRAP Rock is an igneous rock, its mineralogical name is Diabase or Basalt, its origin volcanic. Lava, being emitted from the internal regions of the earth centuries before the glacial period, cooled slowly into a fine grained perfectly uniform unstratified rock.

Our plants are all located in Trap Rock deposits and are all in Connecticut within a fifty mile radius. Most of you have seen Trap Rock, but probably in the crushed state. It will therefore cause some surprise to know that the ledge formation as to structure and seams is different in every one of our eight quarries. Another problem for consideration is that Trap Rock is usually found in hills rising above the surrounding country. This results in an uneven top surface and a variation in height of face of from 35 ft. to 400 ft. or more.

In the day when hand loading was universal, we used the same method of drilling and blasting at all of the plants. This was the snakehole or bench drilling, using piston drills operated from a tripod with air or steam for power. The holes were from 18 to 20 ft. deep, approximately 1⅝ in. in diameter at the bottom. Such a method required close spacing. All holes were sprung and the resultant shot, while not large in tonnage, was well broken for hand loading and delivery to a No. 7½ or 8 gyratory crusher.

When the transition from hand to steam shovel loading took place, it was found difficult in plants exceeding 500 to 600 tons per day, to maintain sufficient stone for shovel loading. It was, therefore, imperative that we experiment and select some other method of shooting which would give us larger tonnage shots. There seemed to be two methods available to produce the results we were after, well drill or tunnel shooting. Having made some unsatisfactory experiments with well drilling a number of years before, and knowing nothing of tunnel shooting, we decided to experiment with the latter first.

No doubt, you are familiar with the principal of tunnel shooting. The charge is concentrated at or slightly below the quarry floor and the efficiency of the shot is dependent upon the rock formation, being such as to break up by displacement. In other words, if the section is displaced by the heaving and lifting force of the explosive and the bottom is properly thrown out, the stone above will break up as a result of the displacement.

The shattering effect of the explosive has direct action upon only a relatively small amount of the stone displaced. Accordingly, a quarry with columnar formation for trying out the first tunnel was chosen. The explosive used was black powder which was not satisfactory. However, a change to 40 per cent dynamite was successful enough to warrant further use of this method.

We consider a minimum height of 75 ft. regardless of formation necessary for tunnel shooting, and our experience has been that proper results are not possible with tunnel at quarry floor level when the face is over 125 ft. high. In blasting a face over 125 ft. high, the ordinary procedure would be to use well drill holes in conjunction with the tunnel. In search of a means to avoid the use of well drills, we are now driving a series of tunnels part way up the face intending to shoot down the 180 to 225 ft. face in two sections by means of tunnels.

The next experiment with tunnel shooting was at a quarry whose face was approximately 100 ft. high. The columnar formation was lacking and there were well defined perpendicular seams at varying distances apart. The result of the tunnel shooting at this plant was to find, after the blast, a large part of the stone in sections from ten ft. up to 20 ft. square.

Apparently, tunnel shooting was not to be successful at this quarry and we, therefore, turned to well drilling, being fortunate that a well drill could be navigated on the top without the aid of sky hooks. It was possible to locate these well holes between seams and this made possible a much better breakage.

A further cause for adopting well in place of tunnel shooting was the close proximity of this quarry to a rapidly growing community. A larger amount of explosive is required for effective tunnel blasting and this resulted in unpleasant notoriety and numerous complaints.

I will now consider two quarries having a height of face from 35 to 60 ft., in close proximity to a residential section. The ledge formation at both these plants is such as to lend itself to either well or tunnel shooting, but the height of face is not sufficient for economical tunnel shooting nor in our opinion for well shooting.

(*Continued on page* 80)

*Presented before the Twelfth Annual Convention of the National Crushed Stone Association.

New Pittsburgh Plant Completes Model Operations of Keystone Sand and Supply Company

The Result of Many Years' Experience of Dravo Contracting Company In Design and Construction of Sand and Gravel Plants

By W. E. TRAUFFER
Associate Editor, Pit and Quarry

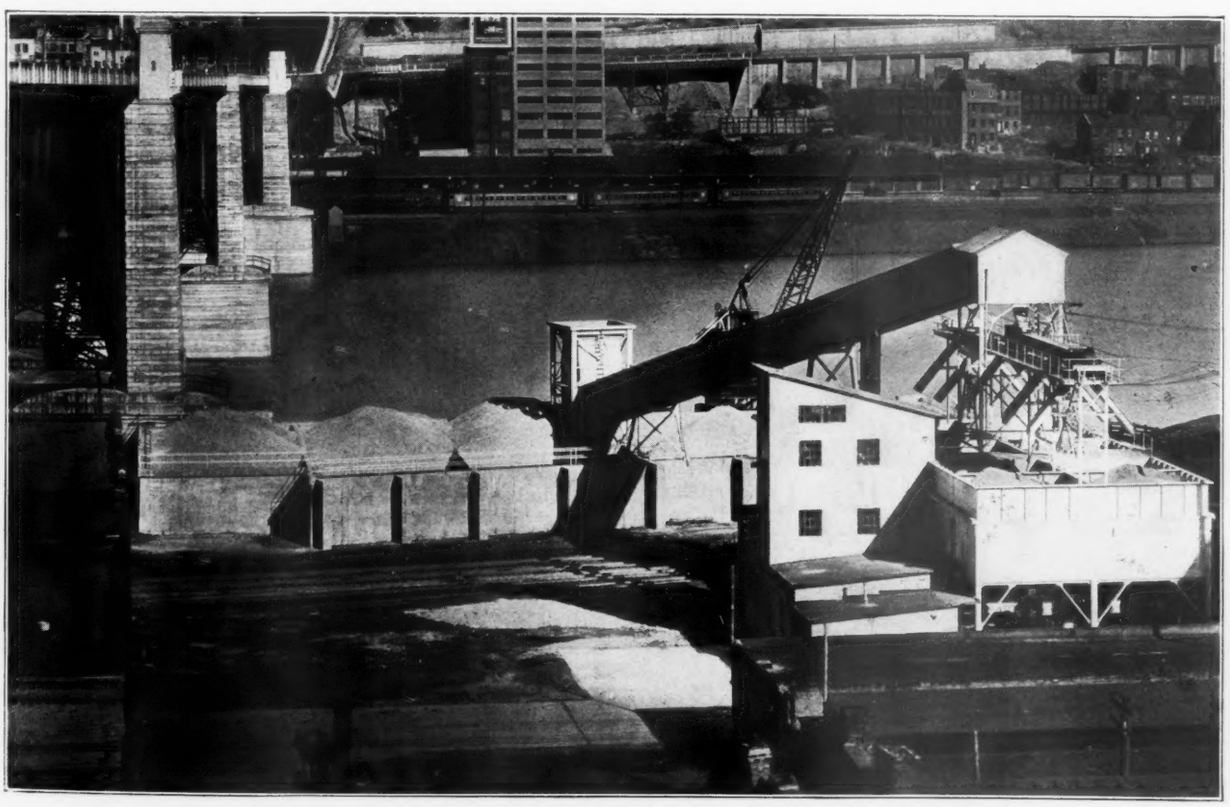
THE Keystone Sand and Supply Company of Pittsburgh, Pennsylvania, operates an unusually complete and efficient system of handling sand and gravel from the dredging of the material to the actual distribution of the washed and sized product to the consumer. This system consists of dredges, barges, and tow-boats which excavate and haul the material to car and truck distributing plants strategically located in and around Pittsburgh on the Ohio and Monongahela rivers.

Dredging Operations

The company first began its dredging operations in 1909, using a single side-ladder type wooden-hull dredge with a capacity of less than 100 tons per hour. The sand and gravel deposits in the immediate vicinity of Pittsburgh were exhausted many years ago. The dredges now operate as far as 20 miles down the Ohio river and 20 miles up the Allegheny river. The material obtained in these deposits sometimes runs as high as 8 inches in size but nothing over 2¾ inches is retained for commercial purposes. No dredging is done in the Monongahela river as it contains only fine, loamy sand suited only for blast furnace use.

Three modern dredges, No's. 4, 8 and 9, owned by the company, are in operation. These are of all-steel construction and have a combined hourly capacity of over 1,000 tons. All of these dredges are of the bucket-excavator-ladder type, made necessary by the hard ground often encountered in the river bottom. Along with all of the other equipment owned by the company these dredges are of Dravo design and construction.

Dredge No. 9, while not the largest, is the most modern of the three, having been in operation only about two years. It is of the regular Dravo all-steel design with a riveted plate hull and structural steel and corrugated-siding superstructure. The excavating ladder is capable of digging to a depth of forty feet and consists of 85 four-cu. ft. buckets, dumping at the rate of 31 buckets per minute.



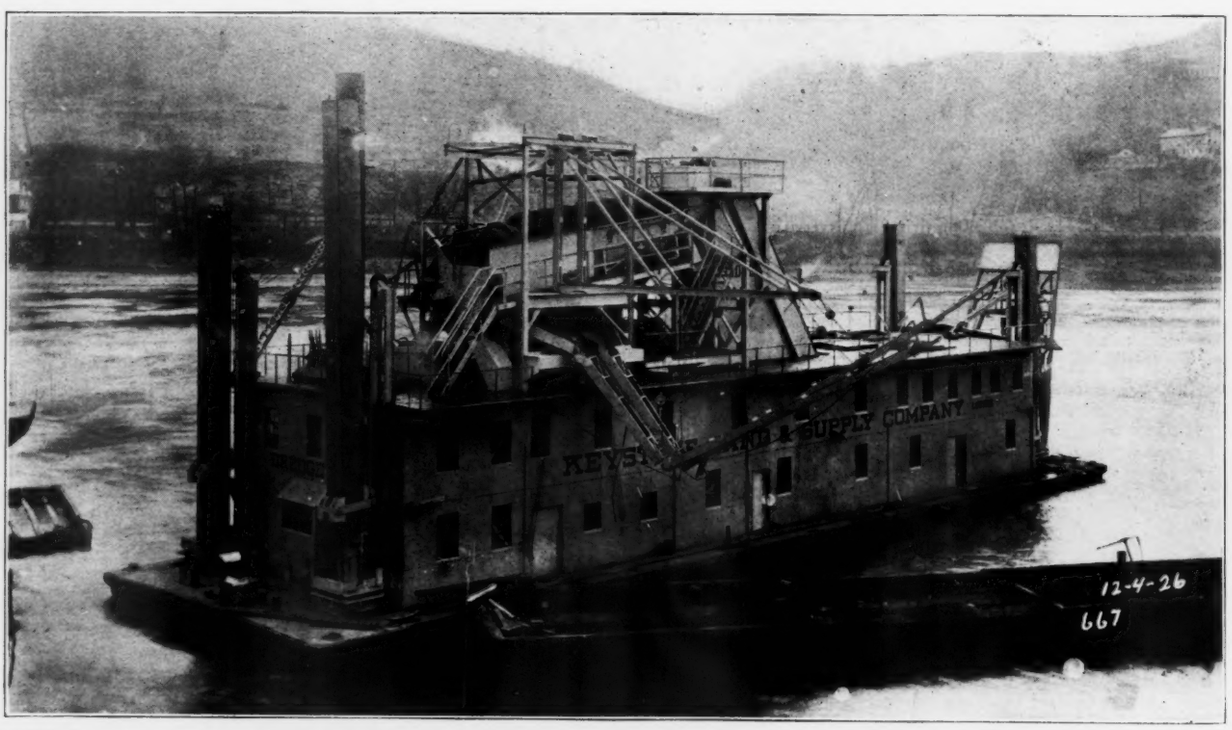
The New South Side Plant, Which Is the Latest and Most Modern of a Series of Material Handling Plants Operated by the Keystone Sand and Supply Company in and Around Pittsburgh

Dredge No. 8 Shown Loading Material Into One of the All-Steel Self-Draining Barges

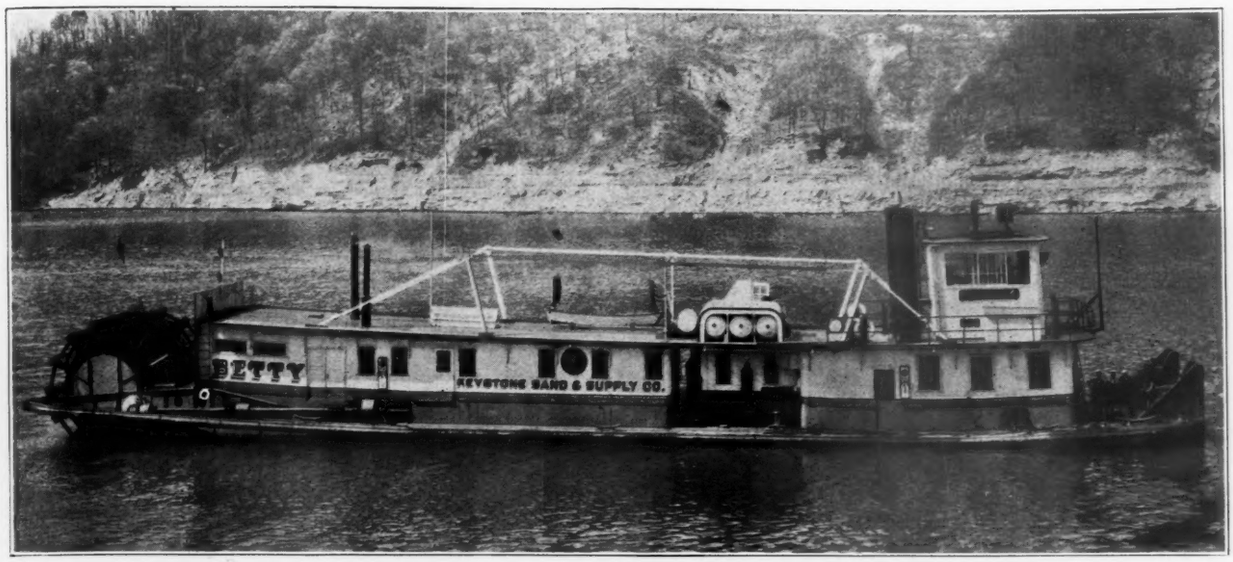
The ladder is of very sturdy yet simple construction, the buckets being of one-piece cast steel, connected to each other by connecting pins.

This ladder discharges into a chute, where the material is washed by three sprays, to a tank. It is then elevated by a conveying ladder, of the same type as the one just described, to the large main revolving screen. Here the material is again thoroughly washed and separated into sand and three sizes of gravel, pea, No. 2 and No. 3. The gravel discharges through two spouts into the barges alongside. These spouts are usually arranged so that No. 3 gravel is discharged from one chute while pea and No. 2 gravel mixed discharge from the other. When desired either of these last two can also be discharged separately.

The sand goes from the main screen to a finishing screen of the revolving type which separates it into two sizes of commercial sand. These go to settling tanks and are then taken by bucket elevator to two spouts, on the opposite side of the dredge from the gravel spouts, and discharged into



Photograph of Dredge No. 9 Taken at the Time it First Went Into Operation, Showing the Main Revolving Screen at the Top



The Diesel-Driven Towboat Betty, the Newest of the Four Operated by the Keystone Sand and Supply Company

barges. The spouts are so arranged that four barges can be loaded at one time.

All of the material-handling machinery is driven by belt and pulley from a Skinner Unaflow 120-h. p. horizontal steam engine. The digging ladder is raised and lowered by a Lambert single-drum, reversible steam hoist. Four 6-in. by 6-in. Osgood steam engines operate the spuds at each corner of the dredge, and the three capstans are also operated by Osgood steam engines.

All of the sixty-four barges in use are of the same modern, riveted-steel plate design. They are

The Engine Room of the Towboat Betty. The Two Main Diesel Engines Are Shown with the Two Auxiliary Engines in the Foreground

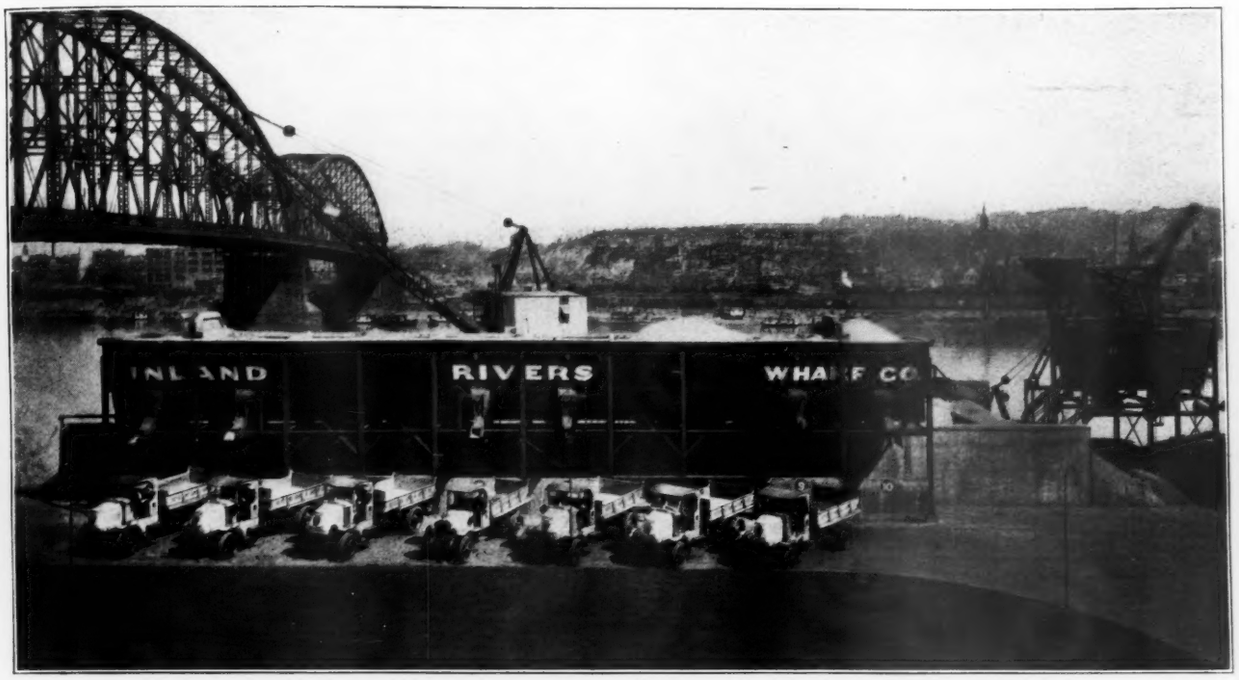
The Car and Truck Distributing Plant at Neville Island. The Shops of the Dravo Contracting Company Are in the Right Background

each 135 feet long by 27 feet wide and 7 feet, 6 inches deep, with a capacity of about 600 tons. The cargo is all stored on the decks of these barges with cargo boxes 30 inches high, so designed as to allow drainage of the material while in transit. Only one kind of material is usually carried at a time on each barge, but if necessary two sizes can be handled.

The Fleet of Towboats

The barges are towed by a fleet of four stern-wheel towboats, one of which is steam and the other three Diesel engine driven. These towboats

The Inland Rivers Plant at the Point. One of the Whirlers Is Unloading Material from the Barges Into the Concrete Storage Bins. The Truck-Loading Bins Are in the Background

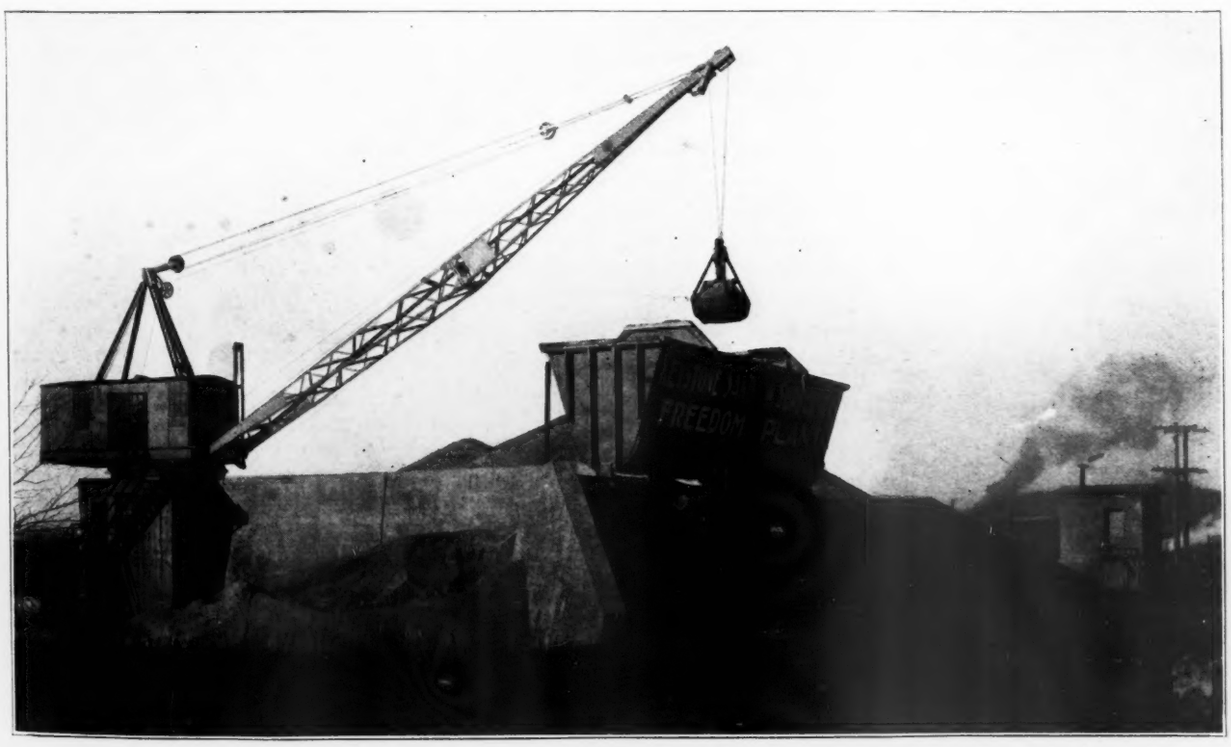


View of the Inland Rivers Plant from the Land Side, Showing the Truck-Loading Bins and the Fleet of Trucks. The Batch Hoppers Are in the Right Background

operate on a year-round schedule, except for an occasional short period during the winter when navigation is impossible. All of these boats, as well as the barges and dredges, were built by the Dravo Contracting Company and designed by the company's engineers.

The "Betty" is the newest and most modern of the towboats, having been in operation only a little more than a year. This boat has an over-all length of 126 feet, 6 inches, a beam of 26 feet, 6 inches, and a draft of 5 feet, 6 inches. It is of all-steel construction with a riveted-plate hull and structural-steel-frame deck-houses sheathed with corrugated metal. The boat has comfortable quarters which will accommodate two crews, a complete dining-room, and a galley. The living quarters are heated by steam from a small boiler in the rear of the boat.

Two Fairbanks-Morse Diesel engines of 240 h. p. each furnish the motive power, driving through



View of the Car and Truck Distributing Plant at Freedom, Showing the Concrete Storage Bins and Truck Loading Bins

The Arrangement of Chutes Through Which the Shuttle Conveyor Discharges Into the Various Bins

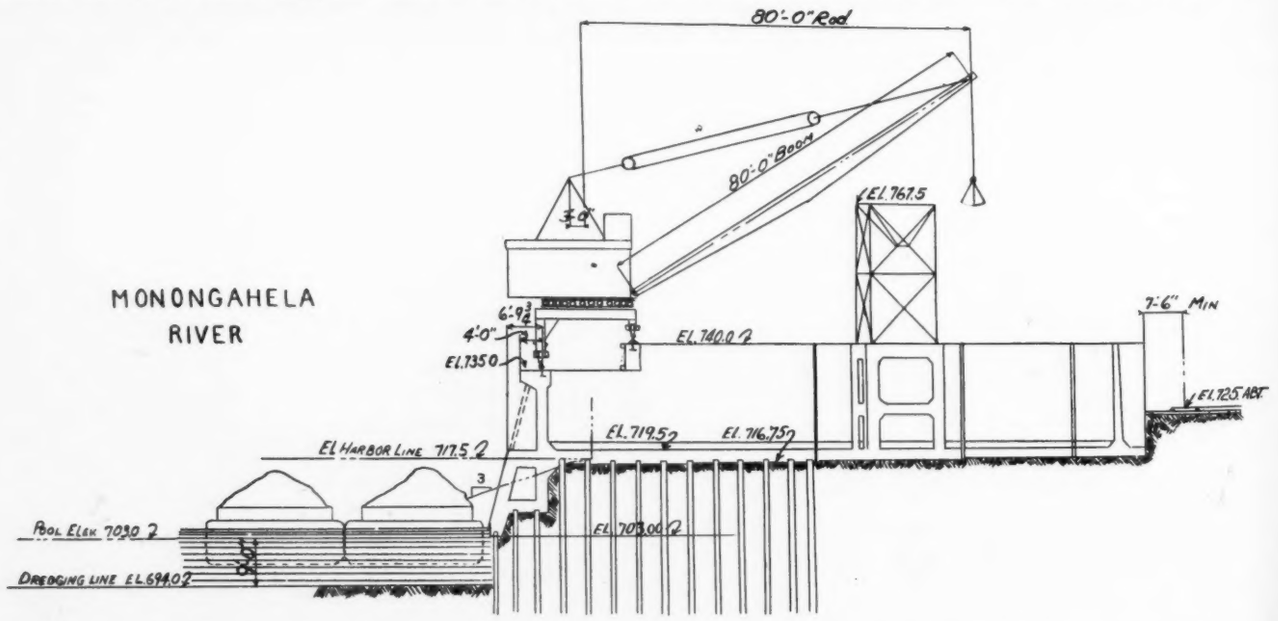
bevel and spur gears the split paddle-wheel at the stern of the boat. Each of these wheels is 8 feet, 6 inches long, and 18 feet in diameter. Two auxiliaries consisting of Climax gasoline engines and General Electric generators, of 40 kw. and 15 kw. respectively, furnish electricity for the light and for the electrically-driven capstans. A 2-kw. Kohler generating set also operates lights and a Kelvinator refrigerator in the kitchen. There are four Dravo electric capstans, the two forward being driven by 25-h. p. and the two amidships by 15-h. p. General Electric motors. The "Betty" hauls six loaded barges at one time. The other two Diesel-engine, direct-driven towboats are the "Virginia" and the "Dorothy," both of which were built in 1922. The "Virginia" is driven by a Fairbanks-Morse 100-h. p. Diesel engine. The steam towboat "Victory" was built in 1917. The Dravo company is rapidly replacing all steam-driven equipment with Diesel engines and electric motors. A. J. Hippert is superintendent in charge of river operations, with Wm. Maclachlan as his assistant.

The Distributing Plants

The Keystone Sand and Supply Company operates three truck distributing plants in Pittsburgh, and five car or car-and-truck distributing plants in nearby localities. At the five car-distributing plants, the barges are unloaded by electrically-operated Dravo whirlers, most of them equipped with 2-yard Williams clamshell buckets, into railroad cars or concrete ground storage bins which have separate compartments for each size of material. The plants at Aliquippa on the Ohio river and at McKeesport on the Monongahela river are equipped for car distribution only.

The plants at Freedom and Neville Island on the Ohio river and at Munhall on the Monongahela river have truck-distributing plants as well. All of these have steel air-storage bins which discharge into trucks for local distribution. The steel bins are filled either direct from the barges or from the concrete ground storage bins. The five plants together have a daily capacity of from 75 to 100 cars of material which is shipped to points within a radius of 150 miles of Pittsburgh and on all railroads coming into the district.

The Inland Rivers Wharf Company plant, commonly known as the Point plant because of its location at the junction of the Ohio, Allegheny and Monongahela rivers is of very modern design, having been in operation only since 1923. It has a frontage of 250 feet on the river with the concrete foundation walls supported on caissons sunk into the river bed. Storage facilities consist of ground



Elevation Drawing Showing the Whirler at the South Side Plant Unloading Material from the Barges Into the Belt Conveyor Hopper

storage in concrete bins of approximately 8,000 tons capacity and steel truck-loading bins having a capacity of 750 tons. This plant has a capacity of 250 tons per hour. The material is loaded from the barges into the bins by two Dravo electric whirlers equipped with 2-yard Williams buckets. The steel bins are designed so that only one-way truck traffic is possible under them. There are also two Johnson batch hoppers and a cement hopper in connection with a cement storage shed for loading ready-mixed concrete trucks. All material is heated by steam from an 80-h. p. boiler which is fired by natural gas. Trucks are weighed on Standard scales. This plant is adjacent to the downtown district of Pittsburgh and is also able to handle some of the North Side business.

The North Side plant is at Westhall Street on the Ohio river, and is so located as to allow delivery to the entire North Side of Pittsburgh. It is located on the property of the Pressed Steel Car Company and is of the same general type of construction as the other plants. Barges are unloaded by a Dravo traveling whirler equipped with a 1½-yard Williams bucket. The ground storage capacity is about 4,500 tons, and the two Johnson batcher-type steel bins are of 75-cu. yd. capacity each.

The New South Side Plant

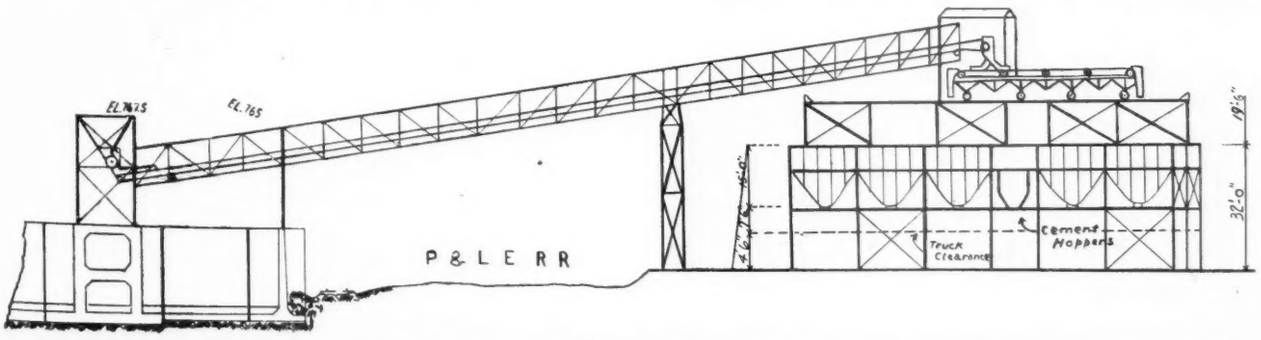
The newest and most modern of the truck distributing plants is the so-called South Side plant. This plant is located at the corner of Third and McKean Streets on the Monongahela river in the Pittsburgh Harbor, one mile above the concurrence of the Ohio, Allegheny and Monongahela rivers. This plant as well as the others was designed and built by the Dravo contracting and engineering forces under the supervision and direction of Alex W. Dann, V. B. Edwards, J. S. Miller and Jacob Hippert. It went into operation early in November, 1928, and has been in steady operation since that time.

The dock frontage on the river is 185 feet and allows from 6 to 8 barges to be handled at one time without trouble. This is largely due to the three Dravo capstans—each operated by an individual Westinghouse motor—which, by proper manipulation of the mooring ropes, move the barges into position so that they may be unloaded without requiring unnecessary moving of the whirler on shore.

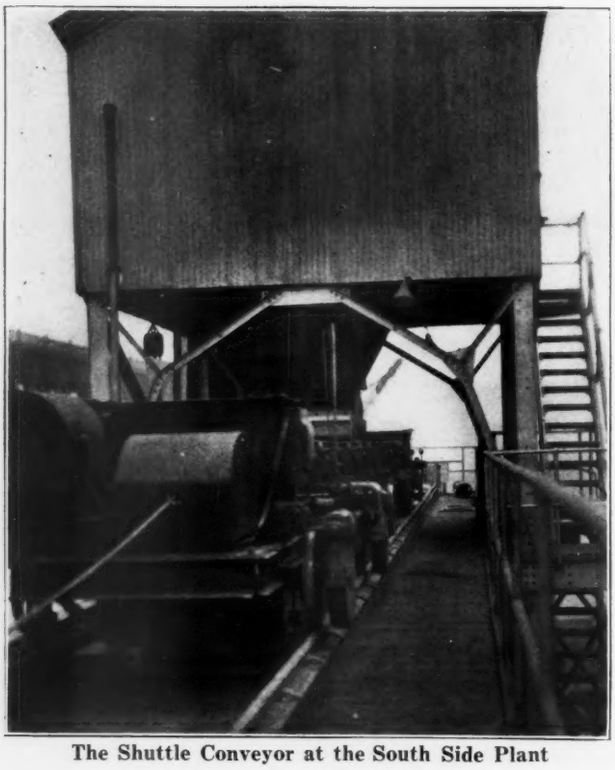
The Truck Loading Bins at the South Side Plant

The barges are unloaded by a traveling Dravo whirler with an 82-foot boom which handles a 3-yard Blaw-Knox bucket. This whirler is entirely enclosed in a glass-and-steel housing, allowing of operation even in the most severe weather. It is mounted on rails upon a structural-steel framework and has a travel parallel with the river of 175 feet. Operation is entirely electric, with Westinghouse 440-volt motors used throughout. The hoist motor is 150 h. p., the swing motor 50 h. p., and the two travel motors 20 h. p. each. It should be stated here that the plant is composed of two distinct units, the concrete storage bins which take the place of stockpiles, and the elevated steel bins which load into the trucks. The concrete bins are sunk below the surface of the ground and are built on concrete pile foundations. They consist of seven sections with a combined capacity of 26,000 tons and, at the time of the visit to the plant, contained No's. 1 and 2 pea gravel, 1½-inch gravel, No's. 2 and 3 highway gravel, and concrete and plaster sands.

The whirler discharges either into these bins or into a steel hopper which feeds a Robins inclined belt conveyor. It can also rehandle the material from the concrete bins to this same hopper. The belt conveyor operates on 275-ft. centers and has



Elevation Drawing Showing the Main Belt Conveyor Over the Railroad Tracks and the Plant Arrangement at Right



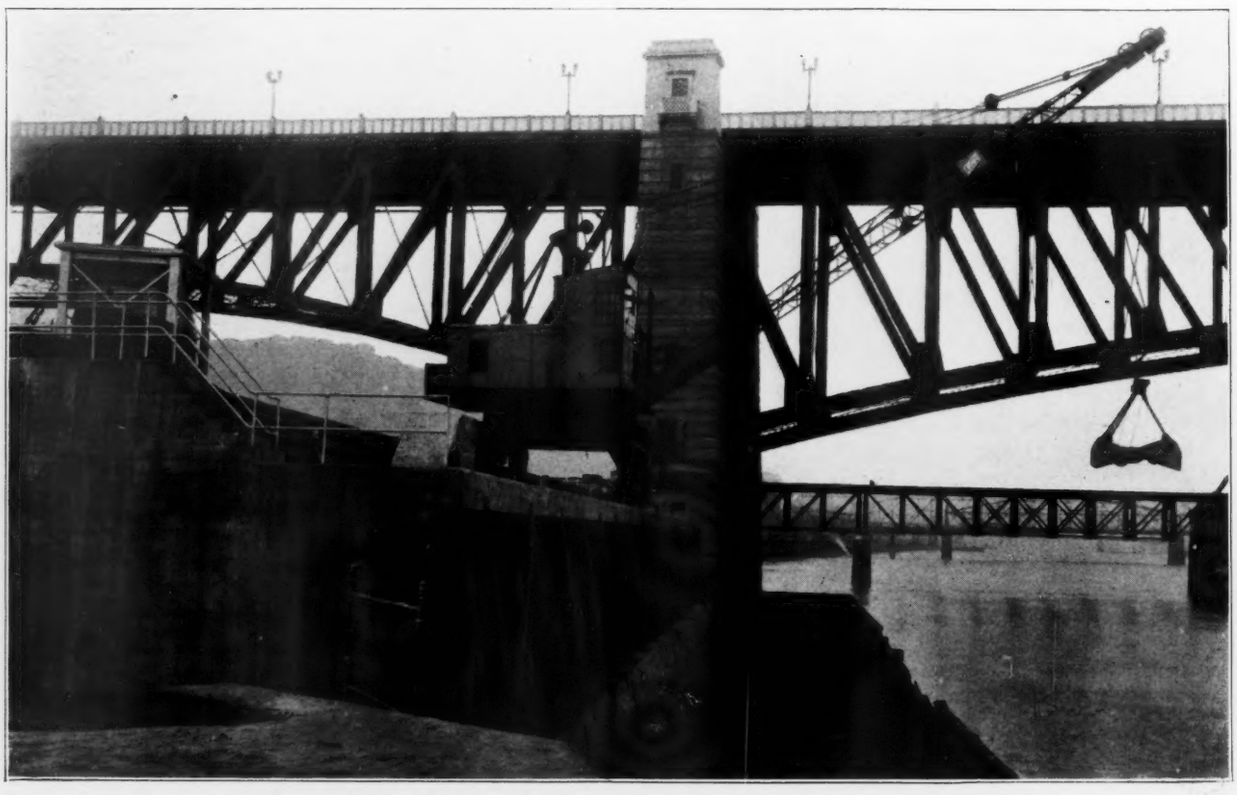
The Shuttle Conveyor at the South Side Plant

a capacity of 500 tons per hour. It is supported on a structural steel framework and is entirely inclosed with corrugated, galvanized-iron sheathing and roofing. The conveyor is driven at the head pulley by a 50-h. p. Westinghouse motor through a DeLaval speed reducer.

The main conveyor discharges through a spout onto a Robins shuttle belt conveyor located midway between the end of the main conveyor and the tops of the steel bins. The shuttle conveyor has a 24-inch belt and is operated by a 5-h. p. motor which not only runs the belt but, by a clutch arrangement, moves it over a space of 25 feet into position over any bin desired. It discharges direct into chutes which convey the material to any of ten elevated steel bins which are of Dravo design and construction. This plant differs from the other Keystone plants in having this long main conveyor between the dock and the truck distributing bins. This installation was made necessary by the fact that the main line of the Pittsburgh and Lake Erie railroad intersects the property between the two plant units. It was decided that the extra cost of construction and operation of this conveyor was much to be preferred to exposing the trucks to the danger and possible loss of time incurred in crossing these tracks twice for each load of material delivered.

The ten bins have a capacity of 200 tons each and are arranged in two rows of five. Each bin is equipped with two discharge chutes, each fitted with a special type door. The five chutes nearest the boiler house are fitted with 3,000-lb. capacity Blaw-Knox batcher bins for loading into batch trucks. These batchers each have a Standard scale on the ground level and can batch accurately by weight any two of five different sizes of aggregate.

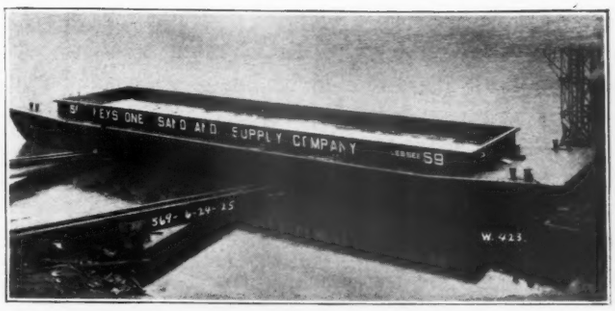
It is also possible to load truck concrete mixers



Whirler Unloading Barges at South Side Plant. The Type of Modern Concrete Construction Used in all of the Keystone Plants Is Clearly Shown

of the Barrymore type by means of these batchers and two cement bins installed in an elevated point between the sand and gravel bins. Cement is trucked to a warehouse adjacent to the bins and boiler-room and elevated in bulk by a bucket elevator driven by a 5-h. p. Westinghouse motor to the cement bins. The cement is also batched by weight into the trucks. Each of the remaining 15 gates under the material bins is of special Dravo swing type and is easily handled from the ground.

Arrangement is made also for heating the aggregate for cold weather operation. Two 80-h. p. coke-fired boilers in the building adjoining the bins furnish steam at 75-lb. pressure. This steam heat is applied to the material by jets in the bottom of each bin and by coil systems inclosed with Celotex, easily keeping the material at 160 degrees in the coldest weather. This arrangement, together with the fact that the large number of bins allows one bin to be discharged while the others are heating, entirely frees this plant from the troubles usually associated with winter operation. To facilitate the movement of trucks under the bins a concrete roadway was built on the property. Only one-way traffic is allowed, the trucks coming in from the street which bounds the property on the east, and leaving by the only possible exit, which leads by the office, thereby eliminating any possibility of trucks getting by without being weighed. The double runway under each row of bins allows trucks to run by other trucks which are being loaded, eliminating any unnecessary delay. The office is a one-story, concrete-block building which contains a 25-ton capacity Standard truck scale as well as the superintendent's office.



One of the Modern All-Steel Self-Draining Barges Used for Transporting Materials

A rest room for the truck drivers is provided adjoining the plant structure. This contains two phones, one on a private exchange by which the drivers can keep in touch with the offices of the company, and the other a regular city phone. This building, together with the boiler-room and cement-storage shed, is of concrete block on concrete foundations and has a structural-steel superstructure with corrugated, galvanized-iron sheathing and roof. The entire plant is operated in the daytime by five men and one man in the office. Rowland Jones is superintendent of this plant, as well as of the two other truck distributing plants in Pittsburgh. A watchman, on the job at night, can also unload material for night delivery. The entire plant is lighted for such night operations.

The Keystone Sand and Supply Company also has associated with it the Standard Builders Supply Company at Leetsdale, of which T. S. Watson

View of the South Side Plant, Showing the Main Conveyor at Left and the Truck-Loading Bins at Right. The Concrete Block Structures from Left to Right Are the Boiler Room, Cement Storage Shed and the Truck Drivers' Rest Room

is manager, and the Charleroi Supply Company at Charleroi, of which O. E. Eyman is manager. These plants are supplied by barge with sand and gravel, and in addition handle a general line of builders' supplies.

All of the equipment used in the various operations of the Keystone Sand and Supply Company, with the exception of a few small items, is manufactured at the Neville Island offices and shops of the Dravo Contracting Company, and is designed by the Dravo Engineering Department. This company designed and built all of the Keystone plants, the barges, dredges and towboats, as well as the dock and terminal structures and the land equipment, such as the whirler cranes and bins.

Officers

The Keystone Sand and Supply Company maintains its offices in the Dravo Building, 302 Penn Avenue, Pittsburgh, which also houses the Dravo-Doyle Company, the Dravo Equipment Company, and the Dravo Realty Company, all of which are associated Dravo interests. The officers of the Keystone Sand and Supply Company are: R. M. Dravo, president; F. R. Dravo, vice-president; Alex W. Dann, vice-president and general manager, and W. A. Bliss, vice-president and treasurer.

Year's Gas Tax Is $280,000,000

By E. E. Duffy*

Spending in excess of two billion dollars for gasoline in 1928, motorists also contributed more than $280,000,000 to the country's highway building funds through the gasoline tax, conservative estimates show. This gas tax money was largely used for constructing first class highways which, happily, reduced car operating costs by an amount greater than the entire gas tax outlay.

The gasoline tax rate, varying throughout the country from two to five cents a gallon, averages 3.2 cents. Without this tax, which adds but from one-eighth to one-third in a few instances, to the gasoline cost, the mileage of hard pavements would be far less than at present, for the gas tax represents a large share of the money available for highway improvement beyond the gravel stage.

Although the total gas tax collection figure of $280,000,000 seems like an immense figure, it actually averages less than six million dollars for each state. It represents but a small portion of the total annual cost of motoring which has been variously estimated from one billion dollars up.

The gasoline tax is now well stabilized as an equitable means for collecting road money. In 1928 only three gas tax changes were made, both upward, while in 1927, 22 changes took place.

A 15 per cent gain in the total gas tax income is estimated for 1928 over 1927. A survey of the figures indicates that although more cars were in operation the gain for the most part was due to increased use of the automobile. The old belief that the gas tax would lessen travel has been dispelled as tabulations have shown that motoring increases with the mileage of improved roads, largely made possible by the tax.

The gasoline tax counteracts the bad roads tax. A. E. Smith, executive director of the Wisconsin Good Roads Association, recently declared that the unimproved roads of his state exacted a toll equivalent to a gasoline tax of ten cents a gallon.

* From the Portland Cement Association.

Portland Cement

A white cement is produced from colored raw materials, by adding small quantities of materials, such as metallic halogen compounds, phosphate or borates which on heating give colorless melts with the colored components of the raw materials. Reducing agents and fluxes also may be used. On the other hand colored cements are made from accidentally pigmented raw materials by the addition of pigments, such as oxides of chromium, nickel. cobalt and copper, together with inorganic salts such as metallic halogen compounds, phosphates and borates which combine with the pigments to form colored melts on heating. With iron-bearing raw materials, the calcination is effected under reducing conditions and metallic iron is afterward removed.—Ammueluther Worke Braume. d. Miag. Mühl. u. Ind. A. G. (British Patents 284,294 and 284,295).

Proposed Increase in Gasoline Tax For Road Purposes in British Columbia

Although the Provincial Minister of Finance is reported to have denied that British Columbia Government contemplated an increase in the gasoline tax from 3 cents to 5 cents per imperial gallon, such an increase has been given the support of several boards of trade and farmers' organizations. It is not improbable therefore, that such a measure will be introduced in the Assembly which meets on January 22. The gasoline tax revenue in 1927 amounted to $751,000. A tax of 5 cents would increase the revenue to $1,251,000, or sufficient to provide sinking fund and interest on a 20 year bond issue for $17,500,000 which it is said here would build 700 miles of concrete highways. (Consul Harold S. Tewell, Vancouver.)

Discussion of Calcium Sulphate and Its Action On the Mechanical Properties of Cement

The Effect of the Addition of Various Modifications of the Salt

By PROF. PETER P. BUDNIKOFF and W. M. LESCHOEFF*

WHAT is the largest amount of sulphur trioxide that can be properly mixed with portland cement is a problem which has not yet been solved. A report, which was made to the Sixth International Congress of Testing Building Materials, mentioned the fact that in many cases concrete, made with a large content of sulphur trioxide, was more resistant to destruction than others which contained only a small proportion of sulphur trioxide. This statement is directly contradictory to existing opinions on the action of sulphuric acid anhydride on the mechanical properties of portland cement mixtures and concrete.

Thus according to Sylt, tests made with 2.5 per cent of sulphur trioxide showed greater resistance than those with 0.57 per cent. Other experimental results have indicated that gypsum of the dehydrated variety, added in quantities which cause no increase in the volume, increase the mechanical properties of the cement. If the proportion of alumina and lime in the cement are decreased, then the proportion of sulphuric acid anhydride can be materially increased. The content of sulphur trioxide in slag cements can be still greater.

The Sixth International Congress of Testing Building Materials, held in New York in 1912, concluded that the sulphur trioxide content of cements should not exceed two and one-half per cent, and it was there recommended that the influence of sulphuric acid anhydride on the mechanical properties of portland cement should be studied. This conclusion led to the institution of quite a series of investigations and researches. One which was conducted by Professor Dr. W. Kind will be mentioned here.[1]

Kind came to the following conclusions in his work. "The addition of gypsum to cement has the effect of lowering to a considerable degree the strength of the cement during the first part of the hardening process, but after the first six months the cements give strength figures, which when plotted in the form of a graph, allow the curve drawn to cut the strength curve obtained with pure cement. Then the former curve shows a tendency to rise steeply. This refers to mixtures of portland cement and gypsum containing three per cent and six per cent of the latter substance." Furthermore, "The addition of gypsum to cement, even if only three per cent, has the effect of decreasing to a marked degree the strength of the cement when subjected to the action of salt water." These conclusions are contrary to those that were obtained by Sylt.

This article is a report of an investigation undertaken at the Charkow Technological Institute of the effects produced on the various mechanical properties of portland cement by the addition of various modifications of calcium sulphate. Both anhydrous or dead-burnt gypsum as well as the dihydrated variety of gypsum were used in the experiments. The attention of the American cement chemist and engineer is called to this article as it represents the work of one of the most progressive establishments for chemical and allied chemical research in Russia, run under the direction of Professor Budnikoff, who is noted for his numerous contributions not only to cement technology but in other fields as well.
Trans.

It has been known for a long time that dehydrated variety of gypsum, when added in a very small proportion to portland cement, retarded the setting of the cement. This phenomenon is ordinarily explained by saying that the gypsum, which does not enter into reaction with calcium hydroxide, requires for its solution a portion of the water, which is added for the purpose of hydrating the lime, the aluminates and the silicates in the portland cement, and in this way it causes a retardation of the speed of reaction, or hydration.

According to P. P. Budnikoff[2], however, the recrystallization of the dihydrated gypsum under the catalytic action of lime, which is present in portland cement, is also a factor. This circumstance undoubtedly plays an important role in the setting of portland cement.

The mixture, containing portland cement and insoluble anhydrite ($CaSO_4$), is also of special interest. For in this case direct crystallization of the dead-burnt gypsum takes place in the presence of a sufficiently strong catalyst.[3] In other words in this case we are concerned with mixtures which can be considered as compositions containing two bonding agents, namely the so-called anhydrite cement and portland cement.

At the same time the work done by Le Chatelier, A. Baykow and others on the influence of water containing sulphates, on concrete has led to the

*A contribution from the Laboratory for Inorganic Chemical Technology at the Technological Institute, Charkow, Russia.

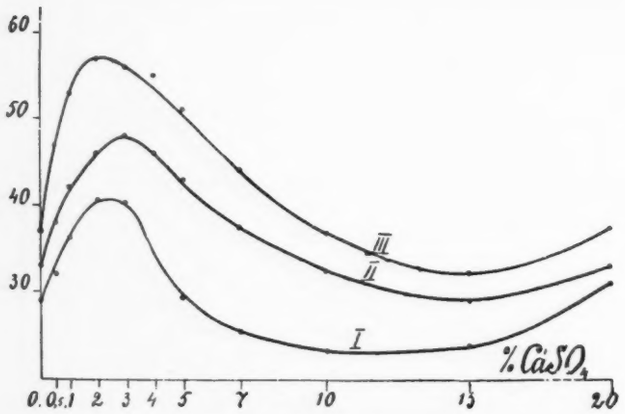


Figure 1—Tensile Strength

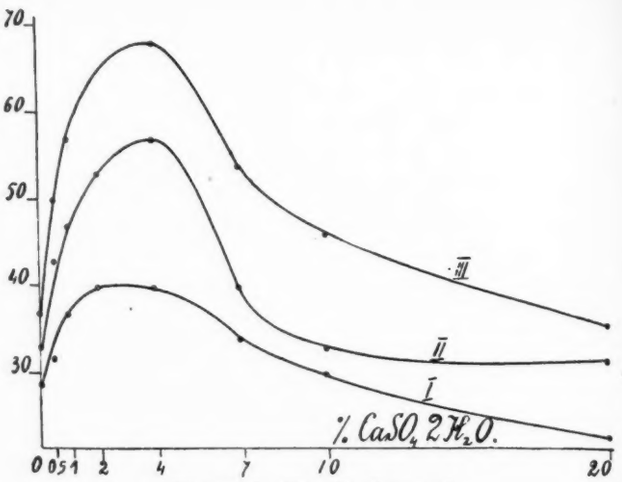


Figure 2—Tensile Strength

conclusion that the greatest destructive action is manifested by those waters, which form sulphoaluminat (Deval salt, $3CaO.Al_2O_3$ . . . . . $3CaSO_4 .3H_2O$) with the tricalcium aluminate which is present in the portland cement.

The rapidity of the destruction of the concrete depends, according to these investigators, on the quantity of alumina, on the concentration of the sulphates, on the porosity of the concrete and on the hydrostatic pressure differential.

The proportion of calcium sulphate and of portland cement as well as the hydration of the dead-burnt gypsum and the recrystallization of the dihydrated variety of gypsum, which is introduced into the portland cement, are all undoubtedly of considerable importance from the standpoint of the mechanical properties of the concrete in addition to the aforementioned circumstances.

In the investigation, which is reported in this article, the influence of additions of the dihydrated variety of gypsum, made in proportions from half a per cent to twenty per cent, and of insoluble anhydrite on the mechanical characteristics of the portland cement has been studied.

The starting material used in the experiments was a supercement, which was prepared from an artificial mixture of marls, the cement being burnt in a rotary kiln. The clinker was specially ground in the cement mill in a special grinder without any gypsum being added to it. Due to the somewhat coarse granulation, it was found necessary to grind the gypsum once again in the laboratory in a ball mill. After this had been done, the gypsum possessed the following degree of fineness:—99 per cent of the entire mass of gypsum passed through a screen with 900 meshes per square centimeter; the residue remaining behind on a screen with 4,900 meshes per square centimeter was 4.5 per cent.

The analysis of the cement, which was carried out according to standard methods for analyzing cement, gave the following results:—loss on ignition 0.87 per cent, lime 68.53 per cent, silica 24.54 per cent, alumina and iron oxide 5.58 per cent, magnesium oxide 0.37 per cent. The total is 99.89 per cent. The hydraulic modulus is 2.27.

No.	Gypsum added	Strength in tension: Investigation No. 1 after 4 Days	7 Days	28 Days	Investigation No. 2 after 4 Days	7 Days	28 Days	First investigation (cube 5x5x5) after 7 Days	28 Days	Strength in compression: First investigation (octagonal) after 4 Days	7 Days	28 Days	Second investigation (3x3x3 cube) after 7 Days	28 Days
1	0	29.0	33.1	37.2	16.5	17.2	23.0	360	440	120	250	360	444	666
	$CaSO^4$													
2	0.5	32.0	37.9	47.1	14.5	17.3	18.0	420	525			406	477	611
3	1	36.1	42.0	53.2	17.6	18.5	23.0	460	630			432	480	572
4	2	40.6	46.0	56.8	17.8	18.0	21.0	500	720			461	505	600
5	2.5	....	....	....	....	....	22.0	....	....			....	....	....
6	3	40.3	48.1	56.1	18.0	19.0	22.8	510	730			485	555	666
7	4	32.0	45.9	55.0	15.3	18.9	23.5	480	715			431	472	639
8	5	29.2	42.9	50.2	14.5	18.7	26.3	440	640			402	452	652
9	7	25.3	37.6	44.0	....	....	....	380	531			380	....	....
10	10	23.0	32.3	36.7	16.8	17.3	24.0	384	468			319	306	622
11	15	23.8	29.2	31.9	....	....	....	382	430			343	....	....
12	20	31.1	32.9	37.3	17.3	19.9	25.0	420	445			383	444	500
	dihyrate													
13	0.5	32.1	42.9	50.1	17.0	19.3	21.3			201	360	480	352	o
14	1	37.2	47.0	56.8	18.0	19.7	20.2			315	500	550	340	v
15	2	39.8	53.0	61.0	18.8	20.8	22.8			392	549	590	386	e
16	2.5	....	....	....	20.4	23.6	25.1			....	....	....	....	r
17	3	....	....	....	24.6	25.2	26.8			....	....	....	444	6
18	4	39.9	57.1	68.2	20.0	24.1	28.7			408	459	530	330	6
19	5	....	....	....	19.3	22.7	33.6			....	....	....	272	6.
20	7	34.0	40.0	54.0	....	....	....			334	385	440	....	6
21	10	30.1	32.8	46.0	15.5	20.8	24.5			289	359	386	280	555
22	20	23.0	31.7	36.1	14.8	23.6	23.0			389	330	385	275	597

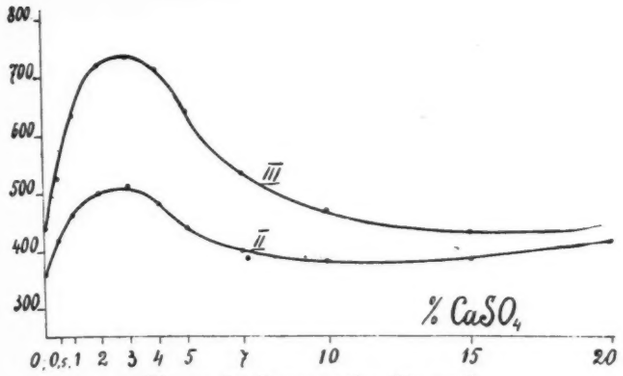


Figure 3—Compressive Strength

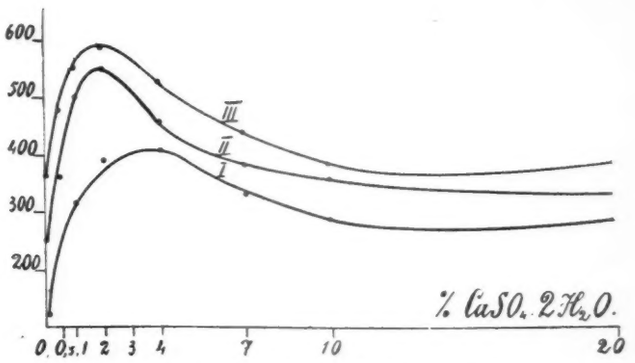


Figure 4—Compressive Strength

The gypsum used in the experiments was first of the dihydrated variety, that is alabaster. The dead-burnt gypsum was prepared by a process which was devised by P. P. Budnikoff. Natural gypsum was burnt at a temperature of approximately 700 degrees C. for a period of four hours and thereafter the burnt product was ground in the usual manner. (This process is described in greater detail in Stroitelnaja Promyschlennost, year 1926, number 2, pages 102ff).

The fineness of the dihydrated gypeum was as follows:—residue remaining on the 900 mesh per square centimeter screen was 0.9 per cent, residue remaining on the screen with 4,900 meshes per square centimeter was 11 per cent. The fineness of the ground insoluble anhydrite was as follows:—residue on a screen with 900 meshes per square centimeter was 1.1 per cent and residue on the screen with 4,900 meshes per square centimeter 10.5 per cent.

The chemical analysis of the two kinds of gypsum was as follows:—

	$CaSO_4.2H_2O$.	$CaSO_4$
Lime	32.25 percent	38.99 percent
Sulphur trioxide	46.07 percent	55.51 percent
Iron oxide and alumina		1.56 percent
Water	20.95 percent	1.41 percent
Residue insoluble in hydrochloric acid	0.29 percent	1.70 percent
Total	99.56 percent	99.17 percent

The determination of the amount of water which is necessary to maintain the normal consistency of the cement is carried out in the usual manner by means of the Vicat apparatus.

Samples were prepared from pure portland cement and different amounts of gypsum for the purpose of establishing the resistance of the mixture in tension. The samples were allowed to remain for one day in an atmosphere, which was saturated with water vapor and were thereafter placed under water.

The portland cement was mixed with the following proportions of gypsum in making the various samples that were tested.

First. Insoluble anhydrite was used in the proportions of half, one, two, three, four, five, seven, ten, fifteen and twenty per cent, based on the total weight of the mixture.

Second. In making test samples with mixtures of dihydrated gypsum, it was found necessary to curtail the experiments for the reason that sufficient cement was not available for making up the samples. Hence the samples were prepared with the following proportions of gypsum:—half, one, four, seven, ten and twenty per cent.

Nine samples, which were made in octagonal form, were prepared from each mixture. Three of these samples were kept for four days before testing, three for seven days and three for twenty-eight days. The breaking tests were made with the aid of the Schopper apparatus.

Compression tests were carried out on samples which were made in the form of cubes, 5x5x5 centimeters, the samples containing anhydrous gypsum. The samples were kept twenty-eight days in one series of tests and for seven days in another. Two samples were tested in each case. The cubical samples were made in iron molds which were coated with vaseline. The tests under compression were carried out in a hydraulic press.

Due to the fact that sufficient cement was wanting, cubical samples could not be prepared for the compression tests with the admixture of dihydrated gypsum. The broken octagonal test pieces were used for making the compression tests.

The compression tests, which were carried out on mixtures prepared from insoluble anhydrite showed that somewhat lower results were obtained in the tests made on the broken tension test samples (octagonal samples) than on the cubical

Setting in hours and minutes						Constancy of volume	
Investigation No. 1			Investigation No. 2			Investigation No. 1	Investigation No. 2
Start	End	Duration	Start	End	Duration		
2.20	4.45	2.25	3.00	5.10	2.10	+	+
1.00	4.30	3.30	5.50	8.10	2.20	+	+
			5.30	9.40	3.10	+	+
1.05	4.05	3.00	4.40	8.00	3.20	+	+
			4.30	6.30	3.00	+	+
1.50	4.51	2.25	4.30	7.30	3.00	+	+
			4.30	7.30	3.00	+	+
2.20	3.55	1.35				+	+
2.20	4.25	2.05	2.40	5.10	2.30	+	+
						+	+
2.55	4.10	1.15	2.10	4.10	2.00	+	+
0.10	0.15	0.05	4.30	6.00	1.30	+	+
			4.50	7.00	2.10	+	+
2.15	4.25	2.10	4.50	7.40	2.50	+	+
			4.50	9.00	4.10		+
2.00	5.15	3.15	5.00	9.35	4.35	+	+
			6.10	10.40	4.30		..
3.10	4.50	1.40				+	..
3.20	4.35	1.15	6.35	9.40	3.05	+	..
3.30	4.50	1.20	4.40	8.15	3.25	+	..

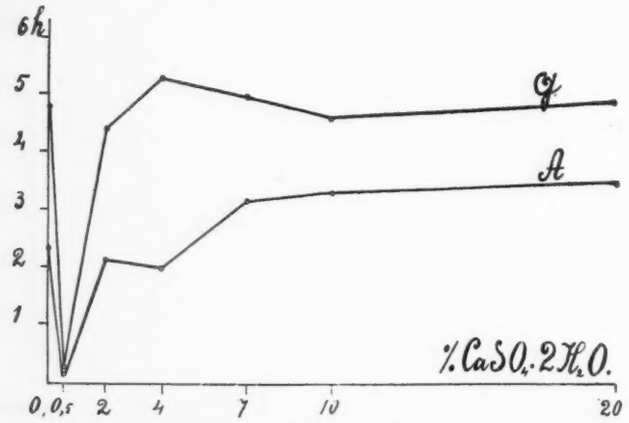


Figure 5—Time of Setting

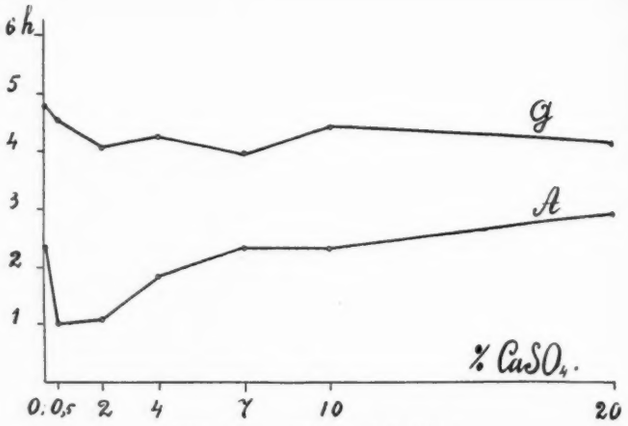


Figure 6—Time of Setting

samples. Hence the figures that are given on the strength of mixtures made with dihydrate should be considered merely as comparative values determining the effect of the various additions made to the portland cement.

Cylindrical samples were prepared for determining the constancy of volume of the mixtures containing various proportions of gypsum. Two test samples were prepared for each mixture, and one set was maintained under water for twenty-eight days while another set was kept under water for three days after the samples had been prepared. Then before they were actually tested, the samples were placed in a drying chamber where they were subjected to a moist atmosphere for two hours at a temperature of 120 degrees C. In all cases there were no signs of any fissures or cracks, and the conclusion is that they all stood up well in the test.

The accompanying tabulation contains the average values obtained in the tests (investigation No. 1). Furthermore, the tabulation contains experimental results obtained with other samples for comparative purposes (investigation No. 2). The following substances were used in preparing these samples. The portland cement came from another Russian mill and another natural gypsum (dihydrated variety) was employed as well as insoluble anhydrite which was burnt at a temperature of 500 to 600 degrees C. Finally the same dihydrate used in the first investigation was also employed here.

The designation (+) in the column headed, "constancy of volume" indicates that the material stood up in the test, and the designation (—) indicates that it did not.

The results which are given in the tabulation are plotted and shown in curve form in Figures 1, 2, 3 and 4. In each case the abscissae indicate the percentage of gypsum added, and the ordinates the corresponding strength in kilograms per square centimeter. The Roman figures I, II and III indicate the experimental results obtained after four, seven and twenty-eight days. Figures 5 and 6 are time of setting diagrams. The curve A indicates the initial set of the cement samples, that designated as G the final set. The ordinates here indicate the time in hours and the abscissae the percentage of gypsum added to the cement.

The best results were obtained with the mixture containing portland cement and four per cent of the dihydrated variety of gypsum. The strength in tension was 39.9, 57.1 and 68.2 kilograms per square centimeter. Good results were also obtained with mixtures containing portland cement and two per cent of insoluble anhydrite. The strength in tension was 40.6, 46.0 and 56.8 kilograms per square centimeter. The samples prepared with two per cent of the dihydrated variety of gypsum gave strength figures in compression of 392, 549 and 590 kilograms per square centimeter and those obtained with mixtures containing three per cent of insoluble anhydrite were 510 and 730 kilograms per square centimeter. The ordinary strength tests on samples made from standard portland cement (not the super-cement) were 41 to 42 kilograms per square centimeter, strength in tension after seven days, and 47 to 48 kilograms per square centimeter, strength in tension after twenty-eight days.

A comparison of these figures with the aforementioned experimental results shows that the values obtained on super-cement with the admixture of two to five per cent of dihydrated gypsum and from half to seven per cent of insoluble anhydrite were not only as great as the first-named but even greater. In all cases where gypsum of both modifications were added to the portland cement in the proportion of half to twenty per cent, strength figures were obtained which were greater than the 1925 Russian standards.

It is likewise worth while mentioning that the mechanical strength of test samples prepared from pure portland cement was less than those obtained on mixtures containing gypsum in almost every instance. The only exceptions to this statement were mixtures prepared with twenty per cent of dihydrate when tested for strength in tension after four days and mixtures prepared with ten and fif-

teen per cent of insoluble anhydrite when tested after four, seven and twenty-eight days.

Within the proportions of one to ten per cent, best results were obtained with mixtures containing gypsum dihydrate. On the other hand best results were obtained with insoluble anhydrite within the proportions of fifteen and twenty per cent. A very characteristic feature is the tendency of the curves to rise in those cases where twenty per cent of anhydrite was added to the portland cement.

The setting curves show that the setting of the cement sets in earlier on the addition of one of the modifications of gypsum used up to four per cent than when pure portland cement is used. The final set sets in later in the cement mixtures which contain four, seven and twenty per cent of the dihydrated variety of gypsum.

Based on the theoretical propositions that were mentioned at the beginning of this article and on the experimental results that were obtained in this investigation, the conclusion must be reached that it is possible that lime sulpho-aluminate can be formed in the mixtures of portland cement and dihydrated gypsum (that is when seven per cent and more of the latter substance is added to the cement), when the samples are stored for a prolonged period of time under water. This is the cause of the decomposition of the samples. Furthermore, this does not mean that the recrystallization of the dihydrated gypsum under the influence of the free lime present in the portland cement is excluded as an additional cause of the destruction, for this phenomenon also has an important effect in reducing the strength of the cement. As far as the action on insoluble anhydrite is concerned, the experiments have shown that it is hydrated under the influence of the free lime and sets. The hydration is accomplished on the surface of the particles, which attained their hardness during the burning process. No change in volume on setting was observed in this case.

The results obtained on the influence of the addition of gypsum on the time of setting are directly contradictory to the assumptions usually made regarding this phenomenon and it is advisable to make a more intensive research into the matter.

It is not possible to derive any general conclusions on the influence of various modifications of gypsum on portland cement from this investigation, for the reason that the experiments were carried out on two cements only.

It is possible that the action of the addition of calcium sulphate would be quite different with other cements. The various raw materials used in making the cement, the burning of the clinker, the conditions of grinding the cement and the gypsum, the use of either the dihydrate or insoluble anhydrite, are all factors which can effect a certain influence on the phenomenon and materially change the nature of the action of gypsum on the various mechanical properties of the cements with which it is mixed.

[1]See W. Kind, Stroitelnaja Promyschlennost, 1925, No. 10.

[2]See Zeit. f. anorgan. Chem., volume 155, page 141, year 1926.

[3]See P. P. Budnikoff, Tonindustrie Ztg., volume 50, page 1009, year 1926.

Concrete Airport Runway Dedicated in Detroit*

With the dedication of the first concrete airport runway in America at Ford Airport, Detroit, today Henry Ford became a pioneer in highways for airplanes just as, twenty years ago, as a member of the original Wayne County Road Commission, he pioneered the first concrete highway for automobiles in this country.

The Ford Airport runway, half a mile long and 75 feet wide, is the first of several to be installed at that port, at which is located the factory where five and six ton air liners are manufactured.

Today's dedication was a feature of the American Concrete Institute's annual convention. Over 200 delegates from the entire country participated in the ceremonies, during which short speeches were delivered by Wm. B. Stout, designer of the Ford-Stout airplanes, and Edward D. Boyer, president of the Concrete Institute.

"Increasing weight of large passenger carrying planes points definitely toward the general adoption of concrete runways," said Mr. Stout. "These big planes must have smooth, hard surfaces, especially to facilitate speedy and safe take-offs. Five and six tons of fast moving machinery cannot rely on ordinary field surfaces. Uniform smoothness and durability are essential. I confidently look forward to the general adoption of concrete runways in airports throughout the country."

"It is natural that this new development in aviation should originate in Wayne County," said Mr. Boyer, "for it was here in 1909, that the first mile of concrete highway was put down. And since that time the county has kept well to the fore in highway development. Henry Ford, who was a member of the board of county commissioners which built that first hard road, twenty years ago, might have been expected to be the first to use concrete in serving the highways of the air. We have here the proof that he has lived up to our expectations."

One runway is already in use at Ford's model airport; another is to be completed this year.

"This port is pioneering the way," said Mr. Boyer, "others will follow. On the west coast a new Los Angeles airport is to be opened next week. There too, thanks to Ford's leadership, we find extensive concrete runways."

*From The Portland Cement Association.

The Effect of an Accident Prevention Program On Production

By P. H. JACOBY*
Superintendent, White Haven Plant, The General Crushed Stone Company

FIRST, I want to say that any accident prevention program put on by any company, corporation, or individual must necessarily be prompted by some good motive, and in many cases I believe the motive which prompts that act is one of sympathy. In my case, I am sure that any enthusiasm which I have shown in accident programs is due to a feeling of sympathy for my fellowmen, of which I feel I have a goodly supply.

Before saying anything about the effect on production of this accident prevention program, let me tell you something about the organization which put into effect this program.

We entered the movement about four years ago, due to a letter which was sent out from the main office, outlining in some detail the organization as it then consisted, a general committee of three men from the eastern office and instructing the superintendents to appoint a committee to consist of not less than five men at the plant, to be known as a safety committee.

I appointed a committee of five, myself included and, by the way, on that committee I have never acted as anything but just a committeeman, never having been put on any sub-committee or acting as an inspector or anything of that kind, by my own request.

This committee meets once a month, or oftener if necessary. Lately, or some time later, the organization has been changed. There was an insurance supervisor appointed under whose direct charge our accident prevention program comes.

The general committee was increased to five members. The personnel of the plant committee has been changed, due to the fact that one of our members was moved to another plant. His place was filled by an election of the remainder of the committee. We also added one new member to it, giving us a committee of six at the plant.

This committee meets once a month by directions from our insurance supervisor who attends those meetings. The meeting will last from one to three hours, depending upon the amount of business. Officers are elected. All questions pertaining to the safety of our employes are taken up at that meeting. If the plant is very busy and we feel that we do not want to take the men away from their employment for several hours, we hold the meeting at night. The committee has always had the assistance of the Independence Bureau of Philadelphia, which on two occasions has sent a representative to go over the entire plant with the plant safety committee, pointing out any dangerous conditions or practices, and suggesting ways of remedying those conditions.

The committee has also had the benefit of a representative of the Bureau of Mines, Department of Commerce, of the United States of America, which sent a representative to the plant who spent about a week with us giving us instructions in first aid work, and upon leaving there he gave us each a certificate, showing that we had qualified to act as first aid men.

Now as to the effect on production of this accident prevention program. That, I feel, cannot be counted in dollars and cents, but the good results we derive from it are manifold. There is not any chance for argument as to the loss of production from accidents.

Result of a Specific Accident

I will try to cite what occurs at the plant when there is an accident of any serious nature. An accident that happened at White Haven about five years ago when a jackhammer operator climbed on to a stone eight or ten feet above the quarry floor. He began to drill a large stone. Some stone above him became dislodged and rolled down and it rolled over part of his body, causing him to have a compound fracture of the right leg below the knee, and many bruises and contusions about the body and head. We had no organization at that time to take care of injured people. Each one did the best he could.

The man was put on a stretcher and taken to the office and we tried to do what we could for him, but none of us did a whole lot. We got in touch with the doctor, whose office is three miles from the plant, and got him after some delay. He arrived in thirty-five minutes, began to administer first aid and temporary dressings, preparatory to moving this injured man to the hospital. We got in touch with the ambulance and it came very promptly.

But after making the temporary dressing, getting this man started for the hospital, we had lost practically an hour, during which hour we might just as well have been shut down, as production had practically ceased.

(*Continued on page* 80)

* Abstract of an Address before the National Crushed Stone Association, Cleveland, January 22, 1929.

Kelley Island Lime and Transport Makes Extensive Repairs

By F. A. WESTBROOK

THE Kelley Island Lime and Transport Company has made extensive repairs to six of the kilns at its Dover Plains, New York, plant during the past summer. This plant was purchased about eight years ago from the Dutchess County Lime Company and has since been operated with the original equipment, plus some additions. There are eight kilns in all. Two of these are of Arnold & Weigel make and are now in operation. The renovation of the six others, now completed, was done by Arnold & Weigel.

As the plant is very complete and has numerous interesting details the following description seems worth while. The quarry is located about a mile and a half from the plant on the east side of what is locally known as the Harlem Valley because it is traversed by the Harlem Division of the New York Central R. R. The plant itself is located adjacent to this railroad and is provided with a freight siding. Connection between quarry and plant is by a narrow gauge railroad.

The quarry machinery is now steam driven although electrification at an early date is contemplated. Thus at the present time the Bury compressor, 14x14x14 in size, is a steam unit supplied by one boiler. Drilling is done with an Ingersoll-Rand tripod drill and a No. 25 jack hammer of the same make. Blasting is done with 40 per cent Trojan dynamite. Stone is raised out of the quarry with a Haltenback & Gniess derrick having a fabricated steel vertical member and a Lidgerwood steam hoist equipped with Roebling wire rope. The steam is supplied by a Godfrey-Keeler vertical boiler.

At the top of the quarry and within reach of the derrick is the narrow gauge track so that the Koppel side-dump cars may be loaded directly from it. A small Browning steam hoist is used to move these cars during the loading of a train so as to temporarily release the locomotives for other service. The trains of dump cars are hauled between the quarry and the plant by two 10 ton Lima steam locomotives. At the plant the cars are pulled up the incline to the top of the kilns by another steam driven Lidgerwood hoist.

A good deal of the lime is shipped in bulk or in barrels. Both metal and wood barrels are used. The cooperage shop is equipped with Niagara Machine and Tool Works machines for making the metal barrels and with the usual devices, mostly home made, for assembling and setting up the wooden barrels, the material for which is supplied by the International Cooperage Co.

O. R. Sturzinger, Superintendent, and One of His Assistants

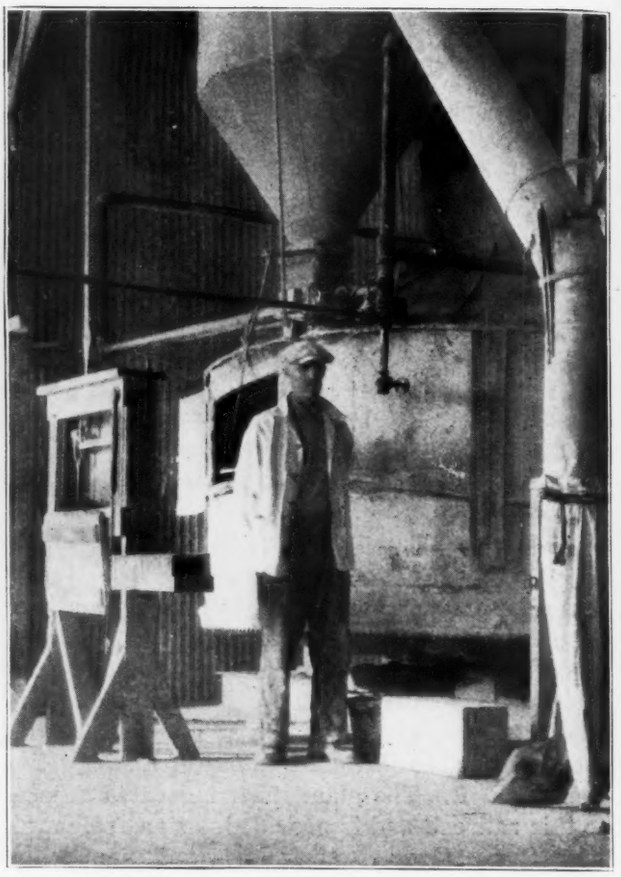
There is also a very well laid out hydrating plant. As the burned lime is taken from the bottom of the kilns it is transported in wheelbarrows to the Sturtevant crusher which is set below the floor so that the barrows may be dumped directly into it. The ground lime is then elevated to the top of the plant and conveyed horizontally by a screw conveyor to the steel bin. This is the source of supply for the Clyde hydrator. The material is weighed on a Chicago scale as it goes into the hydrator, as shown in the illustration.

From the hydrator the lime drops into a bin and is then fed by an automatic feeder to a screw conveyor which carries it to the Raymond separator which is equipped with a Raymond blower. The fine lime is blown into a storage bin over a Bates four valve bag packer and the coarse lime goes to a

Train of Dump Cars Ready to be Hauled to Top of Kilns

different point for use as land lime. There is also a Raymond dust collector for the bin over the bagging machine. This hydrating plant has been in use for ten years and according to the superintendent, O. R. Sturzinger, there is no apparent reason why it should not be used for many more years.

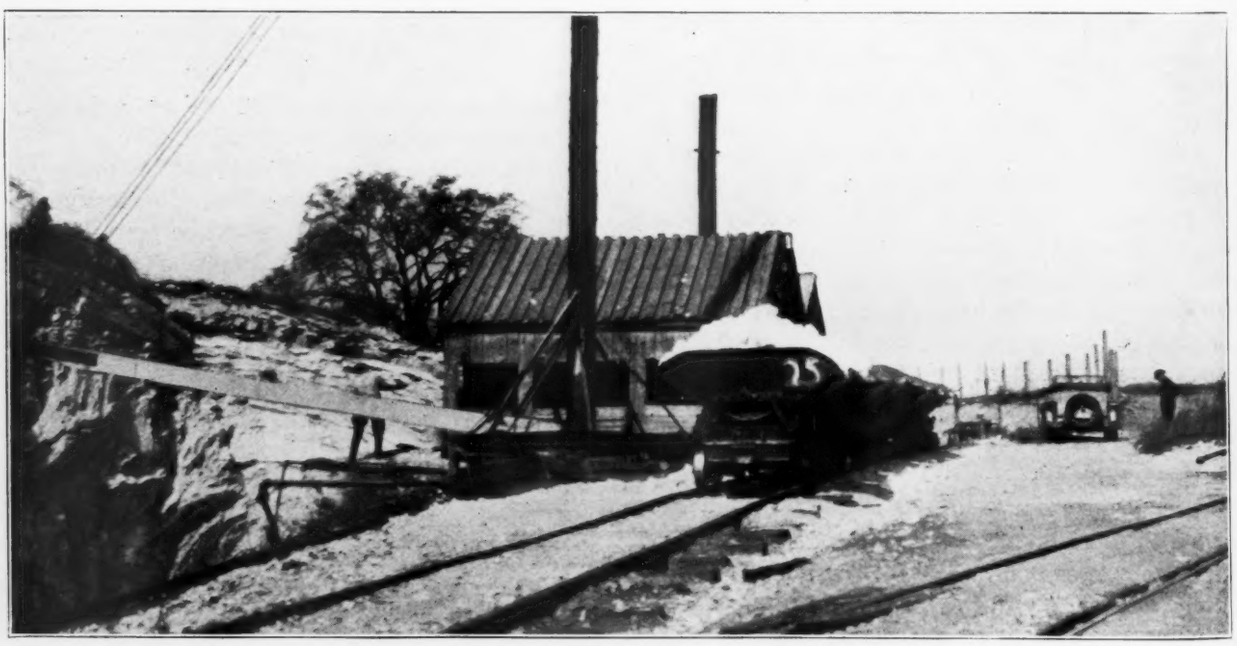
Power to drive the hydrating plant is furnished by an Atlas Corliss single cylinder engine with two 75 h.p. boilers. Only one of these is needed to care for the engine and the other, formerly used to supply steam to the kilns, is now shut down and kept in reserve. This economy has been made possible by keeping water in the ash pits of the kilns instead of blowing in steam. The results from the standpoint of quality and quantity of production appear, after a period of trial lasting several months, to be as satisfactory with the new economical method as with the old.



George T. Record in Charge of Hydrating
Note Hydrator and Scale

Leather belts to which Gandy belt dressing is applied are used and have been found best to drive the machines, although a Gandy belt is used, and gives excellent results for the main drive between the engine and the line shaft.

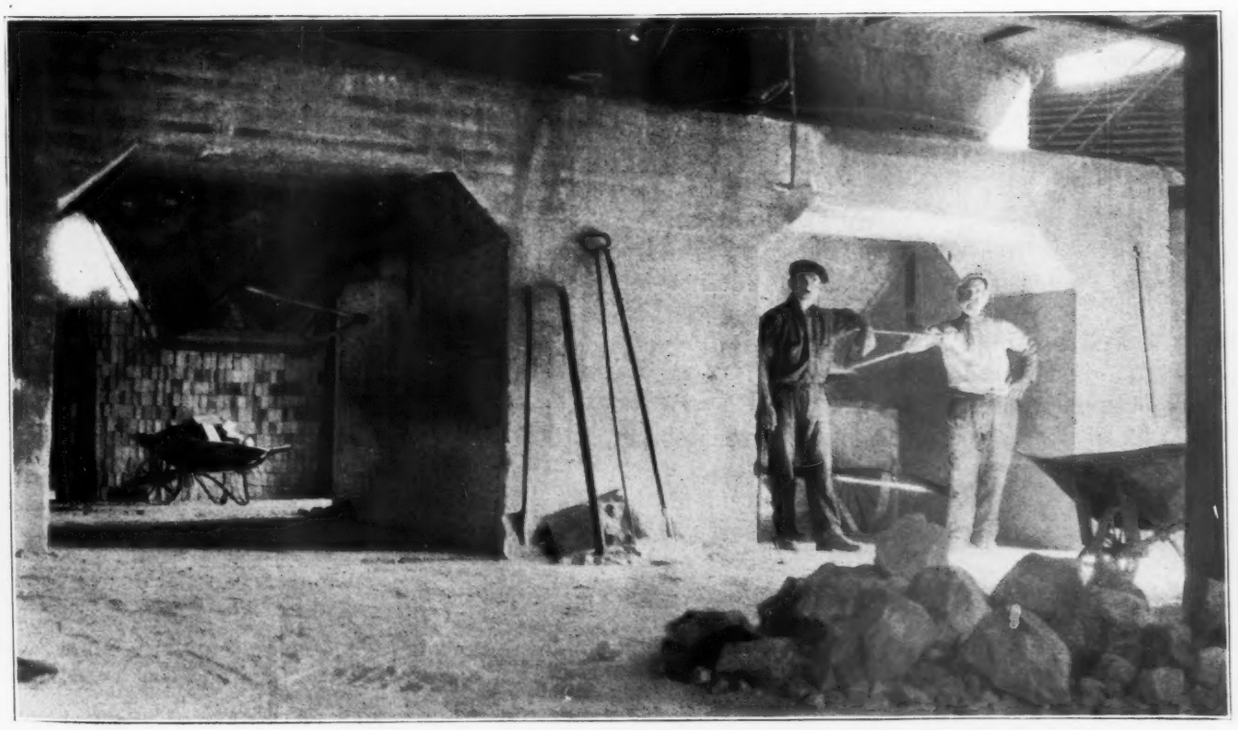
A description of this important operation would



Top of Quarry. Train of Cars Being Loaded

Outside View of Kilns
Six of Which are Being Reconstructed

Blower for the Separator

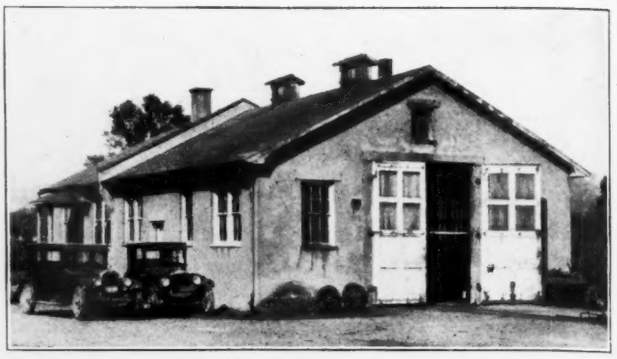


View of Lime Drawing Floor

Hoist at Quarry

not be complete without a few words about the generally excellent condition in which the buildings and grounds are maintained. The buildings are sheathed with corrugated metal and the frame work of some of them is of steel. Of course the fact that steam power is used seems rather surprising but this is a relic of the time when electrical power was not as readily available as it is now and it is planned to electrify all operations within a year. The layout of the plant permits economical operation. The limestone is delivered to the kilns at the end nearest the quarries and the burned lime progresses in a straight line from the drawing floor to the hydrating plant and appears as finished product at the Bates baggers located at the shipping platform. The finished stock storage room is also adjacent to the railroad siding and is situated just beyond the hydrating plant and close to the bagging machine.

A good deal of attention is being given to the question of safety. In looking back over several years a marked decrease in lost time accidents is clearly discernible. Last year there were only fourteen lost time cases which, with an average payroll of forty men, is not bad in an operation of this kind which includes a quarry. On September first of last year Mr. Sturzinger entered the prize contest offered by the Associated Industries of New York for the best year's record. Up to the time of my visit, this record was 100 per cent.



The Office and Shop Building

Very careful detailed records of all accidents, whether lost time or not, are kept so that everything possible can be done, through specific knowledge of what actually has happened, to correct the cause and avoid a repetition. Next to taking precautions in the way of mechanical safeguards and technique, the most effective means of preventing accidents, Mr. Sturzinger feels, is close supervision. This both he and Mr. Strang, the general foreman of the plant, do most assiduously. This seems to help more than anything else in making the men "safety minded," and supplemented with occasional general talks, placards all over the plant and the evidence of safety devices, has helped a great deal.

Motor Vehicle Tax for Road Purposes In Bavaria

The motor vehicle tax in Bavaria is divided between the State, the Districts (Bezirke), and the Communes in the percentage of 55, 27, and 18. It is entirely applied to road maintenance and road building. In the Extraordinary Budget appears an item of M.18,000,000 for road building, to be borrowed immediately and repaid from the proceeds of the motor vehicle tax. This tax the Minister thinks should be raised and he evidently has great faith in its increasing productivity. He cites figures to show that on July 1, 1928, there was:

In the Reich....1 motor car for every 68 persons.
In Bavaria ....1 motor car for every 65 persons.
In Munich ....1 motor car for every 35 persons.
In Berlin .....1 motor car for every 54 persons.
In U. S. .....1 motor car for every 5 persons.

Munich and Stuttgart, he says, have more cars per head of population than any other cities in Germany, but the receipts of the motor vehicle tax as it now is, or even if increased as desired, would not come in fast enough for the necessary road building, and he urges accordingly that the States should be left free to borrow outside of Germany for road building. (American Consul General Charles M. Hathaway, Jr., Munich.)

Inspection and Insurance of Quarry Machinery

By A. C. WILSON*
National Boiler and General Insurance Company, Ltd., Manchester.

ALTHOUGH this lecture deals with quarry machinery in particular, I should like to open it with a few remarks on inspection in general because people sometimes ask whether an outside inspector of machinery can do anything useful which cannot be equally well done by the people who run the plant. It is even sometimes argued that those who live with the machines day in and day out are likely to know more about them than an inspector who only calls at intervals.

In the first place, I think there is little doubt that inspecting is a job in itself. It is not enough that a man understands a particular kind of machine if he is not a trained inspector. On the other hand, if a man is a trained and experienced inspector of machines, his experience tells him what to look for, even though he may not be familiar with the particular operation which the machine carries out. Outside inspection again is valuable because, in a works of any kind, the inspection of the machinery is a sort of anyone's job, which is of course in effect no one's. It would have to be a very large plant indeed which provided a full time job inspecting the machinery, and in the great majority of plants, whoever is supposed to do that work has other things to do as well, and usually those other things are of a more urgent nature. The fact is that nearly everyone in a works is preoccupied with output, and the machinery only becomes important when something goes wrong with it. It is just to prevent that going wrong that inspection, by somebody whose only job is inspection, becomes necessary.

The Human Element Considered

The inspector's visit, followed by the official report from Manchester, does have an importance, and the advisability of making sure that no adverse comments will be passed is recognized with beneficial effects to all concerned.

Most quarries supply their own power, and one of the most popular and most efficient prime movers for such plants is the modern crude oil engine. Among the numerous accidents which may occur to such engines, there are three in particular which involve costly stoppages for repairs, and against which the activities of an inspector are always particularly directed. These are:

(1) Broken crankshaft.

(2) Broken connecting-rod bolts.

(3) Cylinder jacket cracked through the water freezing.

*Paper read before the North Wales Section of the Institute of Quarrying at Llandudno Junction.

The principal cause of broken crankshafts is the slight bending of the shaft which takes place each revolution when the bearings are not quite in line. What usually happens is that the middle bearing, which carries the weight of the flywheel and very often takes also the pull of the belt, wears faster than the others, with the result that the shaft is slighly bent as it revolves, and a fatigue fracture commences either in the web or at the junction of the web and the journal. This want of correct alignment is readily detected by carefully gauging the distance between the crank web in different positions, and it is part of the regular routine in the company with which I am connected to make these measurements with a micrometer gauge measuring to one-thousandth of an inch.

In a four-stroke engine the working stroke is the alternate out stroke, and as all the connecting rod has to do on the suction stroke is to pull the piston out, it might be thought that little stress can come on the bolts either at the crank pin or at the small end of the connecting rod.

Experience tells a different story, and if the brasses are not kept in close adjustment, the knock which results sets up a fatigue fracture with the result that one of the bolts soon lets go, when the piston is probably shot out, the connecting rod perhaps doubled up and the engine bed cracked. That explains why inspectors are so insistent on the prevention of a knock.

Frost precautions again are sometimes regarded as a sort of bogey, but the risk of damage from frost is a very real one, especially in such places as quarries, where engines cannot usually be provided with warmed apartments in which to spend their nights and Christmas holidays.

To come to the machinery which is more particularly quarry machinery, when you have to deal with reports day in and day out, it is surprising to find the regularity, even the monotony, with which the same accident happens over and over again.

Accidents Common to Stone Crushers

Hard steel face on swinging jaw dropped off owing to the securing bolts working loose.

Result: The shaft bent and the bearings damaged.

Pitman broken at bottom where toggle bar rests.

Bearing cap fractured.

Bearing bush of disc crusher fractured.

Toggle support broken.

Pitman broken.

Pitman bearing overheated.

Pitman fractured.

It is quite recognized that some part must go first, and it is better that a comparatively cheap part and one easily replaced should fail than a frame break. Machines cannot very well be built on the principle of "the wonderful one horse shay," where every part was equally strong, and which finally went to glory all at once. At the same time, when a part is found to fail regularly, whether in a machine by a particular maker or in general, there may be a weakness in design, and an Inspecting Company with a wide experience can and does take such questions up in an amicable way with the makers.

The crankshaft of a stone saw broke in halves at the fly-wheel owing to the fact that there was no swell on the shaft. All machines which depend on a heavy flywheel require ample strength in the crankshaft, and the flywheel must be absolutely tight on its keys. The effect of a suddenly applied load is to double its intensity, and if a flywheel has ever so small a movement, every time it has to overcome resistance it comes up against its keyway suddenly and causes a blow. In time this repeated blow starts a crack at the corner of the keyway.

From time to time we find the frame of a stone-breaker fracturing, and when you consider the immense strength of such castings it is difficult to realize how this can happen. A young man who worked stone breakers in France during the war tells me that when they wanted to rest they used to jam the machine till it pulled up, and the belt came off. That would seem to be a practical kind of safety gear, to see that the belt is not too tight and that it would slip off without too much difficulty. It is merely a nuisance if a belt comes off, but it is a disaster if a frame breaks even if you are fortunate enough to hold an insurance policy, because a new frame cannot be obtained in half an hour and a repair, even if practicable, will take days.

In all kinds of elevating and screening machines it is gearing that gives trouble, but I do not think that is due so much to inherent weakness in the gears as to lack of means to take up wear in the bearings which carry the shafts. In some cases also the shafts themselves are too light and the length between bearings is too great. In either case, whether the bearings are worn or the shafts spring, the result is the same, the pinions and gear wheels get out of pitch, and the teeth bear only on the tips where they wear rapidly and finally strip. If means were provided by which the bearings could be adjusted for wear, the pinions could be kept in correct pitch, and this rapid wear of the teeth would not occur.

There was a stone screen of the revolving type at one place which gave a good deal of trouble. In this screen the shaft extended through and was connected to the revolving screen by spiders. The trouble with this machine was that the shaft would break; a remedy was found in stiffening the frame where it carried the middle bearing, after which no further breakages occurred.

In all kinds of machinery of this type far too many accidents result from something working loose. Split pins and lock nuts sometimes seem to become a sort of parrot cry with inspectors, but there is reason in their insistence.

Causes of Accidents

Investigating the cause of accidents is sometimes rather an interesting experience, and one of the first things you learn on this work is the truth of the adage that all men are liars. When you begin to ask questions about what happened, you find that people are much less concerned about giving you correct information than about shielding themselves from any possibility of censure. Among other things I might mention two: the "old flaw" theory, and what I might perhaps term the fallacy of the weakest part. When a steel shaft of any kind breaks, you generally find that about three-quarters of the fracture is black and smooth while only a quarter is a bright crystalline fracture. This appearance often leads people to say, "Oh! there is an old flaw," but actually it is a normal fatigue fracture. A crack starts on the surface perhaps from overheating at a bearing, perhaps as a slight scratch, and this crack gradually extends until oil works in and movement begins to take place between the surfaces of the crack. Finally, when there is no longer sufficient sound metal left to carry the load the shaft suddenly breaks and this final break is the only part which shows bright. A fibrous material like wrought iron does not break in this way, but it is the normal way in which ingot steel breaks when over stressed.

The "weakest part" fallacy is simply this: A part naturally breaks, when it is going to break, at the weakest part, but that does not explain why it broke; it merely explains why, when it decided to break, it chose that particular spot to break at. As an instance, a bolt had a hole drilled right through the center for the purpose of lubrication, and it broke through that hole. Inspector reported that it broke owing to its being weakened by the hole; actually it broke because the clearance space in the cylinder was filled with water, resulting in a sudden shock, and the belt let go at the weakest spot.

Compressed air is used largely in quarries and the receivers are not infrequently allowed to get into a greasy condition internally. This grease, of course, comes from the compressor, and although it may be a protection against internal corrosion,

it forms a potential danger from explosion of oil vapor.

Several explosions of oil vapor have occurred, and as in some instances they could not possibly have been caused by a spark, it is probable they were caused by the high temperature of air delivered by the compressor. Air compressed to 60 pounds pressure in one stage reaches theoretically a temperature of 375° Fahr., which is a dangerous temperature with many lubricating oils. Compressors should therefore always be run with no more lubrication than is necessary—most attendants incline to excessive lubrication—and the pipes and receivers should not be allowed to become coated with grease, especially if the receiver is near the compressor. If the receiver is big enough for a man to enter it should always be provided with a manhole, and it should be insured so as to make certain that it will be regularly inspected. A useful protection against risk of explosion is to fit a fusible plug in the air pipe near the compressor. The fusible metal in these plugs melts at a temperature below that at which there is risk of the oil vapor igniting.

Such vessels should also be protected against overpressure by a safety valve, but as safety valves cannot always be relied on not to leak, it is sometimes better to put the safety valve on the air pipe between the compressor and the receiver instead of on the air receiver itself. The receiver can then be shut off entirely at night by means of a stop valve.

In case anyone should think I am talking about something which could never really happen, perhaps I may be allowed to read a quotation from a report of the Chief Inspector of Factories.

> "Air Compressors.—In Staffordshire two men were killed owing to an explosion of an air compressor used for the starting of three large gas engines. After careful inquiry it appeared that the explosion was due to ignition of a mixture of air and finely divided lubricating oil. This oil was of high flash point, specially made for compressors, and the compressor was effectively water cooled, but it had been run for an exceptionally long time, and had probably become hotter than usual. The explosion apparently originated at the point where the discharge pipe joined the compressor, and this pipe was liable to get very hot."
>
> "An explosion of an air receiver, reported from Leeds was also due to ignition of oil vapor."

If one or two false starts are made with an oil engine, and the receiver pressure is lost in consequence, an awkward situation is created, but there is one obvious way out of the difficulty which should under no circumstances be resorted to—that is to charge chemists. I mention this because it has been done, and possibly will be done again. A mixture of oxygen and oil vapor can explode with great violence, and there are at least two instances of receivers exploding after being boosted up in this way. In one of the instances, unfortunately, a man was killed and another severely injured.

As electric power becomes more generally available outside the town areas, no doubt many quarries will be considering the question of adopting electric power for driving compressors, drills, stone crushers, transporters, and so forth. Many quarries, in fact, do already use motors, generating their power in a steam driven or oil engine driven power house.

The installation of an electric plant involves so many questions, some technical and others of a financial character, that expert advice should always be obtained before embarking on a scheme. In the first instance, it is not easy to compare costs of obtaining power by two entirely different methods—there are many considerations which have to be taken into account, and it is not by any means a foregone conclusion that a small isolated power plant such as a single cylinder oil engine, cannot produce a horsepower as cheaply as it can be purchased from a large power station. Somewhat extravagant claims have been made by political speakers and writers who are interested in electricity schemes, but you will not find all these claims endorsed by the responsible engineers who have to deliver the goods.

Then on the technical grounds advice should be sought as to the type of motor most suitable for the purpose in view and the power required at any particular point. These are just two points among many, and I mention them particularly because they are the cause of a large number of electrical failures. The use of two bearing machines is responsible for many bearing troubles, while short drives necessitating tight belts form another common class of mistake. These two things alone are responsible for a great number of over-heated bearings.

Dust in windings and stamp insulation again are common causes of breakdown. An electrical inspector is always on the lookout for these things, and, of course, in a dusty situation, it is only by continual blowing out that accumulation of dust in windings can be prevented. Insulation tests are valuable, especially if machines are being put into use after lying for some months in a store. The making of insulation resistance tests is, of course, a regular part of inspectors' duties. Here is an example of a report dealing with a fault of this description:

> "A short circuit has occurred between the slip rings in the rotor. The fault appears to have been caused by accumulation of dust behind the slip ring connections and mica tubes. The slip ring covers should be removed for the purpose of clearing away carbon dust deposits at least twice weekly."

Among other electrical failures culled from reports are the following:

"Stampings distorted by granite fragments finding their way into the clearance space through the air ducts."

"Two bearing failures in three weeks, the white metal being extruded through intense pressure. Advised extend the foundation block and fit an outer pedestal."

"Firm report excessive current consumption and frequent tripping of oil switch."

This was a 10 h.p. motor driving a haulage rope, and the cause of the difficulty when finally discovered by the inspector proved rather interesting. This was an arrangement in which skips were hauled along an overhead rope supported at intervals. The system was equipped by the maker with an automatic arrangement at the quarry face by which a bell rang at stated intervals, this being the signal that a skip may be placed on the rope. There was, of course, a good deal of sag in the rope between supports, and the object of the bell was to space the skips evenly and ensure that some would be traveling down the slope while others were going up. Owing to the bell mechanism being out of order and the rope at the same time being unnecessarily slack, it happened that from time to time all or several of the skips were climbing up the hill at the same time, while the hills were also steeper than usual owing to the sag of the rope. The slip rings of the motor were found rough and burnt as the result of the sparking which had been taking place.

Causes of Crane Breakdowns

Coming now to the question of cranes, it would appear from records of breakdowns that quarry cranes often meet with accident, owing to the temporary nature of the foundation on which they are placed.

As a quarry crane has of necessity from time to time to be moved or the direction of the track has to be altered, there is a tendency to consider the foundations and the track rails as only temporary, and due attention is not paid to them. It should be borne in mind that although temporary, the foundations for these have to bear just the same loads as if laid permanently.

Cranes are often erected close to the excavations, and in a position exposed to high winds, due allowance, therefore, should be made in design, in back ballast and in anchoring for excessive wind pressure.

The following are some typical breakdowns which have occurred:

Toppling over of a derrick crane through overloading; the overloading was brought about by an endeavor to lift a block of stone before it was free from the main strata.

Toppling over of a derrick crane due to failure of the timber at attachment to gland irons.

Toppling over a derrick crane due to large stone rolling down the bank and smashing one of the timber guys or back stays.

Toppling over of a jib crane due to overloading.

Toppling over of a jib travelling crane due to a badly laid track.

In connection with grabs there is a point which is not always taken into consideration when estimating the weight of material to be lifted. When dealing with small material the grab practically buries itself and in addition to lifting the material inside the grab it has, before it gets clear, to lift also the material resting on the sloping sides; this may easily add 25 per cent to the load.

Where a grab is required to operate in a confined space or discharge into a railway van or hopper, the double rope suspension type is preferable in order to avoid twisting of the grab. Where circumstances do not permit of a twin rope suspension, a ball bearing shackle should be provided, and it should be fitted between the chain supplied with the grab and the hoisting rope. This has the effect of reducing the tendency of the grab to twist due to rope spin.

The following are points to keep in view when installing lifting appliance: For traveling cranes see that the track is soundly laid, the joints properly fish-plated, and rails are to gauge. For stationary cranes see that foundations are sound and ample, that the weight available for anchoring down will exceed the toppling moment by at least 100 per cent. If loose ballast is used for weighting down the ground sleepers of derick cranes, use cradles to carry the ballast, the cradles to be laid crossiwse on the ground stays or sleepers, thus leaving them accessible for examination. It is important that the joints at the attachment of the back stays or guys to the ground sleepers should always be accessible for inspection.

The following are important points concerning maintenance: Keep all parts painted. Frequently examine anchor bolts. Do not allow any slackness of bolts; this imposes unequal load and shock load on other bolts. Many failures are attributable to this cause. See that all parts of the crane are periodically examined, say weekly. See that the ropes and chains are kept well greased. A rope exposes a large surface to oxidation. If oxidation is allowed to occur the rope is seriously weakened and becomes dangerous. Leave the jib anchored at night. Many accidents to jib cranes are due to the wind blowing the jib round, allowing it to bump the back stay. The latter breaks owing to the shock, and causes the crane to collapse. Do not forget that oblique lifts may overload a crane, although the load actually being hauled may be within the rated capacity of the crane. Careful attention should be paid to regular annealing of chains; each chain should be numbered, and a register kept regarding annealing, testing and repairs. Supply the crane man with diagrams showing what load each chain sling is capable of lifting at various angles.

The Value to the Crushed Stone Industry of the National Safety Competition

By W. W. ADAMS
and
NELSON S. GREENFELDER*

FOR the past four years the United States Bureau of Mines has conducted a safety contest in which approximately 300 mines and quarries, representing 30 of the 48 states, have participated yearly. This contest, which is designated the "National Safety Competition," has for its underlying purpose the promotion of safety in the mining and quarry industries and the development of friendly rivalry among the competing companies.

The immediate object of the contest is the winning of a trophy known as "Sentinels of Safety," which portrays in bronze a mother and child greeting the father upon his safe return from work. The name of the mine or quarry which wins the right to hold the trophy for a year is engraved on the front of the pedestal. There are five of these trophies, presented by the *Explosives Engineer Magazine.*

Whenever a company wins the trophy, a formal presentation ceremony is held. At these exercises all of the officers and men connected with the winning plant, as well as a representative of the Bureau of Mines, are present. The bronze trophy is presented to the Company and a certificate issued by the Bureau of Mines is awarded to each employee whose untiring efforts contributed toward the victory of his Company. Thus, there is public recognition of the fact that only by close and hearty cooperation of employer and employee can safety be most effectively promoted.

Our former Secretary of Commerce, the Honorable Herbert Hoover, now President-elect of the United States, has sent a personal letter of congratulation to the winning companies at the close of each year's contest. His interest in this subject has been an inspiration to those of us upon whose shoulders the conduct of the contest rests.

The scope of the contest is indicated by the volume of exposure to hazard as represented by the number of man hours worked each year. The first year's contest embraced 68 million man hours of work, the second 95 million man hours, and the third 92 million man hours; this means about 28 thousand men the first year, 40 thousand men the second year, and 38 thousand men the third year.

*Presented before the Twelfth Annual Convention of the National Crushed Stone Association.

Companies that enroll in the contest are divided into five groups, according to the commodities produced; namely, anthracite coal mines, bituminous coal mines, metal mines and non-metallic mineral mines, quarries and open-pit mines.

The National Safety Competition considers the accidents of all employees, both surface and underground, but eligibility in the contest is confined to those mines that employ 50 or more men underground and to quarries or open-pit mines which have 25 or more men in the pit. All mines must operate for at least 150 days of the year.

Each contestant agrees to furnish the Bureau of Mines with a report of each individual accident that disables an employee beyond the day of the accident. A carbon copy of the report which the company furnishes to the State Industrial Commission will suffice. In addition to the accident reports, each company furnishes monthly reports of the number of man hours worked. This last item is used as a basis for calculating the accident rates which determine the relative standing of the various companies.

One of the conspicuous facts revealed by the National Safety Competition is that most mines and quarries have much better safety records than one might be led to believe from the accident rates that are so widely broadcast over the country. The stone-quarrying industry offers a striking illustration of this fact. Eighty-six per cent of the quarries that took part in the 1927 contest had safety records which were better than the average for the quarry group. That is to say, while the average accident severity rate for all quarries was 4.4, 86 per cent of the individual plants had accident rates that were less and therefore better than this figure, and only 14 per cent had accident rates which were higher.

In the field of nonmetallic mineral mines, the winners of the contests during the past three years were a gypsum mine at Grand Rapids, Mich., operated by the Beaver Products Company, a gypsum mine at Gypsum, Ohio, operated by the United States Gypsum Company, and the Marquette Cement Manufacturing Company, a limestone mine at La Salle, Illinois. In the last two years the win-

ning mine in this group was operated with no lost-time accidents whatever.

The trophy winners in the quarry and open-pit mine group were the Security limestone quarry of the North American Cement Company at Security, Maryland, another limestone quarry operated by the same company at Martinsburg, West Virginia, and the Mitchell limestone quarry operated by the Lehigh Portland Cement Company at Mitchell, Indiana. As only one company can win the prize, special recognition or honorable mention is given to the companies ranking second, third, fourth and fifth in the competition. This recognition is in the form of a letter from the Director of the Bureau of Mines advising the company of its high rank in the competition. In addition to this, honorable mention is also given to any Company that operates its plant throughout the year without a single lost-time accident. There is perhaps no better way of securing and maintaining close cooperation between a company and its employees in the realm of accident prevention than by joining in such an endeavor as that afforded by the National Safety Competition.

In the absence of uniform records for the entire crushed stone industry, the National Safety Competition has made available uniform and comparable accident records for a part of the industry, a small part to date, but one which should grow from year to year. So far as can be ascertained, these are the only records covering all lost-time accidents that are prepared in such a way as to make possible a fair comparison of the quarry accident rate of one State with that of another State and at the same time to establish a general basic rate as a standard for all quarries.

Inasmuch as the National Safety Competition comprises the records of coal mines, metal mines and stone quarries from the various States, it is laying a foundation for determining the true relative hazards between the States and their different kinds of plants. This information should be useful in helping to develop more equitable insurance rates for the different branches of mining and quarrying. That is to say, the records will help to develop the mathematical constants which determine the fixing of accident insurance rates. With these constants established, the relative cost of accidents may be determined, for it should be said that insurance figures now available do not reveal the true relative hazards as betwen industries in different States. They do not purport to show more than the actual receipts and disbursements on account of accidents. The true costs of accidents, as distinguished from the actual payments made on account of them, are basic and should be portrayed in their true proportions without reference to changes in the compensation laws of the different States and without reference to variations in the wage scales of the employees.

The difficulty, if not the impossibility, at the present time of comparing the frequency of accidents in one State with that in another State, is shown by a study of the classes of injuries covered in the yearly reports published by a few of the State inspection departments. The reports published by the Pennsylvania Department of Mines cover only injuries that cause 60 or more days of disability. This means that more than 90 per cent of the injuries which are taking place are not covered by the published figures of that department. If accident rates were calculated on the published figures only, they would appear extremely low and would reflect only a very small part of the injuries that are actually occurring. The West Virginia Department of Mines also publishes figures that appear to omit many lost-time injuries. The Illinois reports apparently cover only 7-day accidents, which means that more than 30 per cent of the injuries are omitted. The report for Alabama contains no statistics of non-fatal injuries.

Now as to certain features of a safety contest such as the National Safety Competition. First of all, the contest places all quarries on an equal basis as regards opportunity to win the prize, at least as far as it is physically possible to place all quarries on an equal footing. Second, the method of determining the winner is absolute and free from uncertainties due to differences in human judgments. It is as far as practicable, placed on an exact mathematical basis. Personal opinion plays no part in arriving at a decision, except in the case of a tie between two or more companies. Third, the contest utilizes and capitalizes the natural instinct and desire of a man to surpass his fellows in any undertaking. It is natural that each company should strive to win the prize because that prize denotes success and leadership in the prevention of accidents. Thus the natural human attribute of ambition is brought into play in a most useful direction. Fourth, the records which the competing companies furnish to the Bureau of Mines for purposes of the contest constitute a valuable source of information as to the causes of accidents in the crushed stone industry.

In order to stimulate interest in accident prevention throughout the Crushed Stone Industry, the *Explosives Engineer Magazine* in 1926 presented an additional bronze trophy, differing in design from the Sentinels of Safety trophies, to be used as an annual award to the quarry operated by a member of the National Crushed Stone Association making the best record in the National Safety Competition. The two companies making the next best records receive honorable mention and are awarded a framed reproduction of the trophy. The winners

of these special awards are determined by the United States Bureau of Mines from the statistics made available by the National Safety Competition. There has been a gratifying increase in the number of quarries entered in the competition by members of the National Crushed Stone Association since this trophy has been offered.

In 1927 the National Crushed Stone Association trophy was won by the Speed quarry of the Louisville Cement Company, with the remarkable record of 227,750 man hours worked and an exposure of 2,934 hours per man, without an accident. The Monroe quarry of the France Stone Company, with a record of 70,170 man hours worked, and an exposure of 2,810 hours per man without a lost-time accident, and the Gasport quarry of the Wickwire Spencer Steel Company, which operated 221 days, working 91,042 man hours, and had one accident causing two days' lost time, making a frequency rate of 10,984 and a severity rate of .022.

The 1927 Safety Competition between members of the National Crushed Stone Association entered in the National Safety Competition was an exceedingly close race, as can be seen from the fact that three quarries established the enviable record of going through the entire year without a lost-time accident. As all three of these quarries completed the year with perfect records, the U. S. Bureau of Mines, in accordance with the rules of the contest, rated them according to their respective man-hours of exposure.

On this basis the White Haven sandstone quarry of the General Crushed Stone Company, located at White Haven, Luzerne County, Pennsylvania, earned the distinction of being the winner of the 1927 contest. The White Haven quarry operated in 1927 a total of 310 days with an aggregate exposure of 159,320 man-hours.

First honorable mention for obtaining the second best safety record was given to the Louisville Cement rock quarry operated by the Louisville Cement Company and located at Speed, Clark County, Indiana. This plant operated 253 days and had an aggregate exposure of 152,087 man-hours.

The limestone quarry of the Wickwire Spencer Steel Company, located as Gasport, Niagara County, New York, received second honorable mention for third position. This quarry operated 212 days and had an aggregate exposure of 85,667 man-hours.

Executives of the companies who have won the National Crushed Stone Association trophy are perhaps better qualified than the writers to appraise the value of the National Safety Competition to the Crushed Stone Industry because the opinions of these operators are based upon their actual achievements.

Harry D. Baylor, of the Louisville Cement Company, which won the trophy in 1926, said last year at the West Baden Springs Convention of your Association: "It seems to me that we ought to have the membership of the National Crushed Stone Association vigorously engaged in this competition. We feel at Speed that the reason we have been able to put across our own individual record is due to the fact that we have our whole plant divided into a number of divisions, nine in all, which are engaged in a friendly safety contest. I feel that competition can be applied in a much larger sense to the whole crushed stone industry, and we are losing something if we do not all enter into it.

John Rice, President of the General Crushed Stone Company, whose white Haven quarry was the trophy-winner in 1927, speaking at the Annual Safety Congress of the National Safety Council on his company's entire safety program, said: "A questionnaire to our superintendents as to the effect of the movement discloses in their judgment a distinct improvement in the morale of their men, a greater interest in their work and many resulting economies.

"As one of them expresses it, they have all come to realize that a trained man on the pay roll was a lot more valuable than on a compensation list.

"There is a growing and increasing belief by the men that the company is really interested in their welfare, not sentimentally or piously, but sensibly and wisely.

"It is interesting to note that in the National Safety Competition inaugurated by the Explosives Engineer under the auspices of the United States Bureau of Mines for such quarries in the membership of the National Crushed Stone Association as entered the contest, our White Haven plant won the trophy for 1927, not having had a lost-time accident for eighteen months. Our Winchester plant during July had only forty-five minutes lost time as the result of accidents of any nature whatever, men or machinery, which is an admirable record in our experience.

"I cannot reduce to dollars the resultant benefits of this intensive safety movement on our part, but I believe it is no exaggeration to say it has effected a saving of 10 per cent in our operating expenses and 30 per cent in our accident expense."

Although the National Safety Competition is only one phase of the organized program which is accomplishing the worthwhile results which Mr. Rice mentions, it is significant that each year from the very beginning of the competition every eligible quarry operated by his company has been an active competitor for the distinction which was finally achieved.

Washed Limestone Sand

By DR. HERBERT F. KRIEGE*
France Stone Company, Toledo, Ohio

IN THE stone industry, spasmodic efforts have been made from time to time to prepare a suitable fine aggregate for concrete purposes. Usually efforts have been met with rather indifferent success because the material which was produced for that purpose was not much more nor less than screenings without any thought as to gradation, cleanliness of material and suitability in general. As a result, the materials were not favored any too strongly by the engineers who were most cautious in the use of materials. The name, limestone sand, began to imply what screenings implies, so that it was simply selling the same product under a new name.

The production of limestone screenings for conversion into sand has been successfully done by a number of companies. The Marble Cliff Quarries at Columbus, Ohio, have several goods jobs, a road that I can think of just now, and the Ohio State University Stadium, and other jobs which precede anything that we have done.

With the washing of stone the ability to manufacture a well-graded, clean, fine aggregate presents itself to the stone industry. To the chips and limstone dust which are recovered from the crushed stone on the screens by washing may be added the desired proportion of No. 7, or screenings as commonly known, to give practically any kind of a screening analysis that may be desired.

The operation I am speaking of happens to be at the Silica plant of the France Stone Company. The wash water with its charge is carried by a flue to a settling tank. The height of the water in this tank is controlled by flood gates so that the amount of material remaining in suspension, the very fine material, can be controlled quite accurately. If the overburden happens to be more plentiful at one time or another, and the amount of fines entering into the flue be greater than at another time, by lowering the flood gates in this case the flow of water through the tank is made faster and carries away a greater amount of suspended material, or carries it down to a coarser size.

A drag conveyor, dipping down into the tank, moves the material, now free from its excess of below 100-mesh which you may call the particles classified, up an incline, which drains it of its dirty water and then another spray of water strikes it so that it is given another washing. It then falls upon a vibrating screen. We have been using ¼ inch most of the time, on which a strong spray of water falls to cut up the wet mass and insure thorough screening through the vibrator.

Then below the screening is the car to receive the finished sand, which is now washed, classified and screened and distinctly becomes a manufactured product.

To prove the quality of this product, three series of mortar tests were conducted. The first was a comparison with standard Ottawa sand and the next Maumee River sand and then bank sand from Michigan, as the two latter sands are produced in the Toledo vicinity.

The strength developed by the limestone sand averaged 41 per cent higher than the standard Ottawa, 32 per cent higher than the bank sand, and 57 per cent higher than the Maumee River sand on a 1:3 mix.

In a later series, information was sought regarding the effect of the fine material, that is the material below 100-mesh, since it was within our power to control quite effectually the amounts of this fine material retained in the sand. The usual highway specifications for below 100-mesh fines in sand will lead from 0 to 5 per cent. These low limits have been deemed wise since natural sands are most commonly used and in these the below 100-mesh materials consist chiefly of silt and clay, which, of course, are undesirable in concrete. The finest fraction of the limestone sand in this particular case, even that below 200-mesh, has a composition approximating the parent material quite closely, running as high as 93 or 94 per cent carbonate still and should therefore be free from objection. The particles under microscope are very definitely clean, sharp, angular fragments of limestone.

The limestone sand was screened to free it from below 100-mesh particles. Then there remained that which laid well within the Ohio specifications for screen analysis. Mortar series were then made up with this sand as a basis and compared to the same sand to which material below 100-mesh was added in increments of 4½ per cent, the idea being to make one sand mortar which had no below 100-mesh, the next which had 4½ just within the specifications and increments, then up to 13½ per cent going well beyond what is normally permitted.

Thus, the first sand was within the specifications which were laid down, while the others contained considerably too much below 100-mesh material to be acceptable.

The results of the average compression strength

*Abstract of a paper presented before the Highway and Sales Conference of the National Crushed Stone Association, Cleveland, Ohio.

of these three cylinders, 3 by 6 inches for each series, are, assuming the mortar which had no 100-mesh material to be 100 per cent, the values read this way: 4½ per cent gave 139 per cent strength, 9 per cent fines gave 123 per cent strength, 13½ gave 143 per cent strength, indicating that, with the exception of a slight dip in the curve for some reason, the 9 per cent, the increase in strength was quite marked for an increase of the below 100-mesh material with this sand even up to 13½ per cent.

On a 1:6 mix the effect was even more pronounced. One would think that if the fine material was objectionable it would be most objectionable where the leaner mix is employed. There would be the greater relative amount of fine material. Also, if it is detrimental, it would be more effective at later ages and at earlier ages. Just the reverse was found to be true with this particular sand and its fines.

Again, assuming 100 per cent as the basis for the sand having no 100-mesh material, we find these percentages: 140, 137 and 165, as we increase the percentage below 100-mesh. These results indicated definitely that a larger per cent of below 100-mesh material could be used to advantage with this washed limestone sand.

With this fact in hand the Ohio State Highway specifications were changed to permit 0 to 7½ per cent below 100-mesh material in this new product.

As an example of the material produced, the following average screen analysis is given, representing five weeks of production.

I will give this two ways in case you are used to thinking of it in one way or another. Above 4-mesh—.9 per cent; 4 to 10—28.9; 10 to 20—29.2; 20 to 30—13.0; 30 to 50—12.9; 50 to 100—12.6; below 100—6.5.

In the addresses of the previous speakers, particularly that of Mr. Kelly, it was suggested that the gradation of the fine aggregate should have a high point at approximately the 20 or 30-mesh point. This comes just a little bit earlier, indicating that the sand is a trifle coarser. The fineness modulus runs about 2.9 to 3.1. The voidage is quite low, being approximately 31 to 32 per cent, in a measure the determination being made by shaking to refusal. The coarse, rather closely inscreen analysis to the ideal curve, so-called, as worked out by Mr. McCall, formerly of the Portland Cement Association—who began with below 100-mesh material and combined that in several portions with the next larger size until the densest mix was obtained, using that densest mix with the next higher size. That type of curve, using all the fractions, gave a value which happens to come quite close to the one that our natural sand producer, or the limestone sand produced.

The surface area of this sand, as calculated from its screen analysis, and converted to the basis of spheres, runs approximately 6.3 square inches per gram of material, which again is comparatively low. Bank sands in Michigan which have approximately the same voids as this sand does will have a surface of probably 33 to 50 per cent higher. No doubt, when lean mixes of mortar are considered, the surfaces which these aggregate particles present and which must be cemented together in order to make a unified mass, will in a measure control the strength of the mortar which is produced.

On the basis of some experimental values, the mixes being made up in the laboratory with 4 or 5 or 6 kinds of aggregates, usually using both slag and stone as well as gravel, show these values for the 7 and 28 day compression, which the sand produced. That was not material which was graded for any particular purpose but simply commercial material, including slags, gravels and stone, this limestone sand also.

For 7-day strength: 2480; for 28-day: 3750. That is not outstandingly high at all, yet including all kinds of aggregates, some of which were well graded and some very poorly graded. The transverse: 7-day, 540; 14 days, 640; 28 days, 740. These values are all on a cement content of 6 sacks per cubic yard.

During the past year the Highway Departments of the states and Lucas County have employed approximately 12,000 tons of this material in the construction of 10,000 miles of I. C. H.-21, running out west of Toledo on Central Avenue. This runs past the Silica plant at which the material was produced and affords a very fine opportunity for studying it under practical conditions.

The material, both the fine and the coarse aggregate, was batched at the plant. The cement came from the nearby Medusa plant, so that it was a truck-hauled job all the way through and the batching could be easily affected. On six and a half miles of this pavement limestone sand was the only fine aggregate used. At that time the consumption overtook production and the limestone sand had to be diluted with bank sand.

It was used in all proportions, beginning with probably ¼ bank sand and then finally to 100 per cent bank sand. As a result that 10-mile piece of pavement gives a very fine laboratory and field study of this particular limestone fine aggregate alone as compared with a good grade of bank sand in several proportions, and with the bank sand alone, over a 2-mile period.

Beginning at the top we have the oldest concrete and one which contained limestone sand only. The dilution with bank sand began with these values here, the two later values. They show just a little bit of increase in facts, in strength, over the batch

just preceding. Other than that they are pretty much in line with the road as a whole.

The average age of 107 days, the average compression strength of those cores is approximately 48 pounds, which is a very satisfactory average.

In analyzing the data which the state collected a little more carefully, one of the things that impressed me particularly was the fact that there was no great variation in the strength found. The uniformity was very satisfactory. That indicates that there must have been workability of a desirable nature and that there was nothing very erratic about the whole thing. Eventually what we are concerned with is quality of concrete and uniformity in that quality.

The cores showed 75 per cent lying within 15 per cent of the average of them all. That is only 25 per cent were farther than 15 per cent of their value from the average, which I think for a pavement being paid under a variety of conditions during the summer and early fall, is worth noting.

The ability to produce this limestone sand with close control as to sizing throughout the distribution curve, suppose that the upper and lower limits open a field of special uses, such as complete aggregate for certain concrete products, the servicing of floor and sidewalks, and so forth, in practically every plant in which the limestone sand may be produced, it will be possible to have not only No. 7 as that is desired, but possibly also No. 6 in case either of these two special uses may be called for.

Limestone sand suitable for concrete fine aggregates is no longer a fairy tale. The balance of practical uses have weighed this produce and found it not wanting.

Chemical Industries to Hold Its Twelfth Exposition

The Twelfth Exposition of Chemical Industries will be held at the Grand Central Palace, New York City, May 6 to 11, bringing together thousands of chemists, chemical and research engineers, manufacturers, and buyers from forty-odd industries, is particularly significant of the advancement made in the chemical industries field during the last quarter of a century.

The various groups of this industry, as represented at the exposition, will exhibit the most modern equipment and advanced practices of chemical engineering and chemistry. A cross-section of the metals group shows fifteen exhibitors who will show various alloys and includes such outstanding producers as Crucible Steel, Vanadium Steel, International Nickel, Duriron, Inert Metal Products, Inc., Industrial Welded Products Co., Carpenter Steel Co., Globe Steel Tube Co., Titusville Forge Co., Nelson Metzler Corp., Lalance-Grosjean Mfg. Co., Ludlom Steel Co., Central Alloys Steel Co., Babcock & Wilcox Tube Co., and Fansteel Products Co. For the first time there will be exhibited a new acid-resisting alloy by Krupp. This metal has many special and unusual features that will be of great interest to the Chemical Industry. Considerable research and new development work has been undertaken during the past year in perfecting special alloys. The latest discoveries in this field will be presented in attractive displays by foremost manufacturers.

In the Laboratory Supply and Equipment group, a number of interesting exhibits will be assembled: laboratory furniture; general laboratory apparatus and supplies; special laboratory equipment; filter papers; optical instruments; laboratory chemicals; platinum ware; instruments of precision; electrical apparatus; laboratory balances; glassware, porcelain, silica ware, and plastic compositions. This group will have in its various exhibits complete displays, charts and graphs of all equipment and the functions it is designed to perform.

The Instruments of Precision group will have a number of exhibits, among which will be an exhibit of a spectro-photometer and hydrogenion colorimeter. A number of balances, microscopes, high-temperature furnaces and color-analyzing apparatus will also be exhibited. A new method of connecting vitresoil pipe lines will be presented.

Attendance is confined almost entirely to users and buyers of chemicals and chemical equipment. Admission is gained only by invitation and registration. There are no tickets sold. To the last Exposition there came 67,000 men looking for ideas and information to aid them in the conduct of their business. This picked group of interested visitors came from 810 cities and towns in 40 states and 119 cities and towns in 39 foreign countries.

The Student Courses are being arranged and speakers assembled for the various lectures. The course will be under the direct supervision of Dr. W. T. Read, Professor of Chemistry from Texas Technological College, and the enrolled classes promise to exceed the record of 162 special students who attended the complete course at the last Exposition.

It might be interesting to note that of the 40 industries which are dependent in their operations upon a chemical change in the nature of the material, or are under chemical control, 20 of them produce 17 per cent of all the products manufactured in the United States and employ 22.6 per cent of the capital invested in manufacturing, producing eight billion dollars worth of finished products. Whether in peace or war the chemical industry is the foundation for progress and development of every other industry in the United States. As consumers of power the Chemical Industries rank first in coal consumption and second in the use of electrical energy.

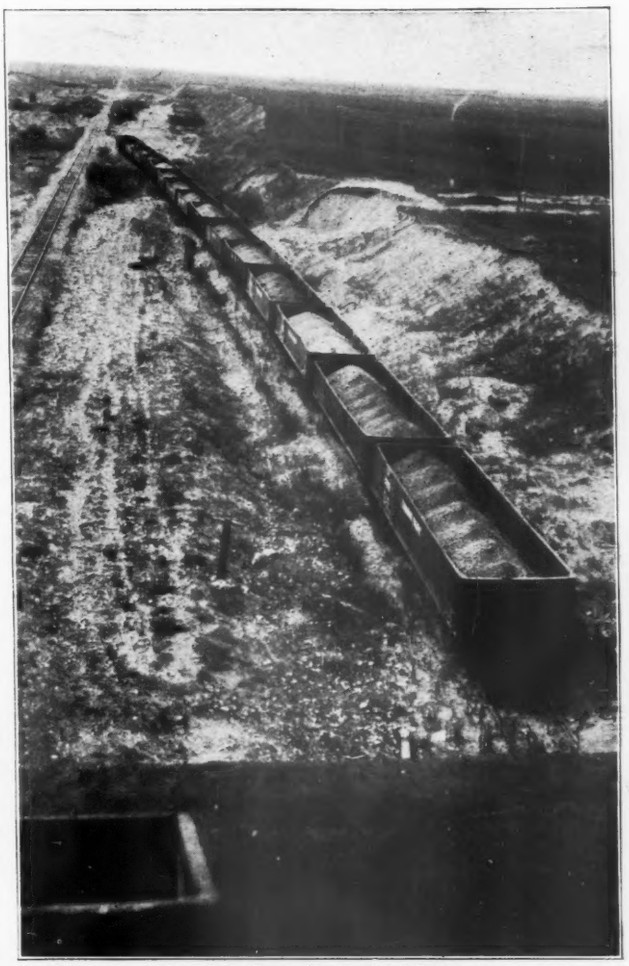
MacKenzie Supply Company Finds Ready Market for Various Aggregates

THE sand, gravel and crushed stone plant of the MacKenzie Supply Company, Limited, is located on the Canadian Pacific Railway at Imperial on the bald prairie. Imperial, Saskatchewan, Canada, is 83 miles north of Regina and exactly midway between the cities of Regina and Saskatoon, which afford a ready market for the material produced at the plant.

The deposit was discovered when the Canadian Pacific Railway was building a branch line from Regina to Saskatoon about 15 years since. The deposit was only operated for a season during the war by Barnett, MacQueen and Company, which was building elevators in the interior for the Dominion Government. The plant was later purchased from F. R. MacQueen by the MacKenzie Supply Company, which has been successfully operating the plant.

The pit is a hogback, extending over at least 220 acres of land which was evidently deposited by a glacier in the morning of the formation of the earth. On either side of this section of land on which the gravel is located the deposit runs off into fine sand and finally into a black gumbo soil which indicates that the deposit is of glacial origin. So far the depth of the deposit has never been reached, although the pit is being worked to the water line about 30 feet below the surface.

The natural run of the bank is from a coarse, gritty sand to granite, hard-head and all classes of



Loaded Cars from the Plant

Full Revolving Shovel Loading into a Hopper with Car under Hopper

Aggregate Being Loaded into Cars

Conveyor Belt Taking Crushed Rock from the Disc Crusher to the Rock Bins

boulders up to 13 or 14 inches in diameter. There is no limestone found in the pit, but the road contractors have been able to get a strength of about 3,000 pounds per square inch on street paving work with a 1:6 mix of this aggregate.

The material is excavated by a Byer's bear cat full revolving shovel which operates a 5/8 yard capacity bucket from which the material is dropped into a field hopper. From the field hopper it is drawn through a steel chute into 3 yard cars and transported over 60 pound rails to the washing, crushing, cleaning and screening plant. With reference to this shovel, according to President W. R. MacKenzie, it has loaded as high as 800 yards on different occasions. This was done during the season of long daylight days which Saskatchewan enjoys in the midsummer season.

The material is dumped from the car onto a 1 inch grizzly bar, and that which passes through the screen goes around a by-pass and joins that

Bottom End of Crusher and By-Pass with Disc Crusher in the Background.

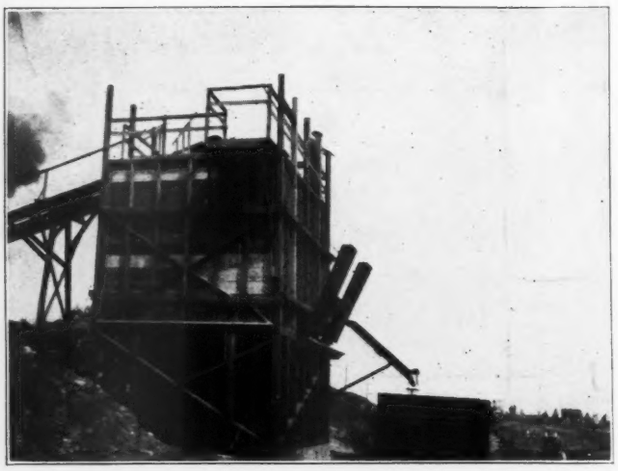
Three-Yard Car Taking Load to Tipple

Top of Tipple with Car Ready to Dump on Grizzly

Bank of Pit, Showing Aggregates

Grizzly and Top of Number Five Gyratory Crusher in the Background

Main Conveyor Belt for Aggregate Which Run About 65 Per Cent Over the One Quarter



Crushed Rock Bins with Railroad Car Under Chute

which runs over the grizzly and through a number 5 Gates gyratory crusher. This rejects through a 24 inch Symons disc crusher, and passes from the Symons crusher onto the main conveyor for making aggregates and then into the cars over a 24 inch rubber belt with 80 foot centers.

The material which goes up the belt from the disc crusher as shown in the illustration is a concrete aggregate running about 65 per cent over the ¼ inch size and is loaded in cars as shown in the illustration.

When it is desired to make straight crushed rock, it is simply taken from the aggregate. It is then run into the rock bins for the use of contractors who require that class of material.

For most of the concrete work in that district, and especially where the work is supervised by engineers, Imperial Gravel is said to be the best available in the Province of Saskatchewan. The General Motors recently erected a large assembly plant in Regina for which this aggregate was used exclusively after testing many of the gravels produced locally.

Voluntary Cooperation in Self-Government

Voluntary cooperation in self government by industry is a practical and essential part of present-day management methods. The fact that industry can, and does, get together and plan greater economies in both manufacturing and selling, is borne out by a statement just made public by the Division of Simplified Practice, United States Department of Commerce. This statement reviews the degree of support accorded the more than 100 simplified practice recommendations promulgated to date by American Industry since the establishment of the Division within the Department of Commerce in November of 1921.

The Division of Simplified Practice is the only organization engaged in waste elimination, through simplification and standardization, which makes an annual factual review of the extent of usage of its recommended practices and standards. In 1925 the average degree of adherence was 67.55 per cent, based on two surveys made; in 1926 it was 75.51 per cent, based on 11 surveys; and in 1927 it was 83.22 per cent based on 20 surveys made.

Twenty-four simplified practice recommendations were audited during the calendar year 1928, to ascertain the average degree of support that each has received. According to the report just made public by Ray M. Hudson, Assistant Director of the Bureau of Standards in charge of the Commercial Standards Group, of which the Division of Simplified Practice is a part, the manufacture of commodities covered by these twenty-four programs was 87.03 per cent in conformity with the respective program. These twenty-four surveys, or audits, were divided into the following groups:

"The consistently higher degree of adherence for a steadily increasing number of completed simplifications can mean but one thing," declared Mr. Hudson in his report, "and that is, American Industry has found that simplified practice pays, and pays well. If there were not dollars and cents benefits from simplified practice, industry certainly would not stick to the programs."

The division of Simplified Practice has received many reports from acceptors of simplified practice recommendations regarding the practical value of the programs. These range from the reported savings of $20,000,000 that is accruing to business from the development of the simplified bank check, to the savings that an eastern manufacturer of self-opening die-heads reported. He has reduced his inventory $225,000 and saved $13,000 in annual interest charges thereon, as well as $10,000 through reduced obsolescence, and $12,000 in office payroll. The simplified practice recommendation for self-opening die-heads reduced the varieties of this commodity 75 per cent.

Simplified Practice Reports Ready for Distribution

A list of over 100 simplified practice recommendations proposed and accepted by Industry and endorsed by the Department of Commerce, may be obtained, free of charge, upon request. This list includes all of the subjects mentioned in a recent article entitled "Simplification in the Non-Metallic Industries" by Geo. H. Cooper, published in the February 13th issue of PIT AND QUARRY. There are many others which should prove of interest and should mean savings to the Industry, if adopted. Please address your requests to the Division of Simplified Practice, Department of Commerce Building, Washington, D. C.

What Management Week Means to the Concrete Industry

FRED E. KUNKEL

CONSIDERING the fact that Management Week, which is to be held in April, is in every respect a purely local undertaking, at community expense, and voluntary in every respect, it is surprising to note what nation-wide interest this phase of industrial activity has aroused.

Begun in 1922, under the auspices of the American Society of Mechanical Engineers and the Taylor Society, it has gradually grown and spread, until in 1927, the movement included as sponsors also the Society of Industrial Engineers, American Management Association, American Institute of Accountants, National Association of Purchasing Agents, the National Association of Foremen, the National Association of Office Managers, the Life Office Management Association, and the Department of Commerce.

Because of the fact that R. M. Hudson, Chief of Division of Simplified Practice of the Department of Commerce, has acted as secretary of the National Committee on Management in the past, the belief has spread in many quarters that the department is mainly responsible for the movement. It is not, and this year a change has taken place also in the method of handling the movement due to its very large growth.

The purpose of Management Week is to hold educational meetings, throughout the country, of industrial and commercial executives and officials for the purpose of directing attention to various specific problems of management. The movement has assumed such proportions that, although it is only a husky youth in its seventh year, the idea of a forum or round-table discussion of individual problems is rapidly coming to the fore. The most profitable meetings are those held for everybody with prominent speakers discussing the important phases of a general management theme proposed by the National Committee, such as Management's Part in Maintaining Prosperity, and then encouraging a general discussion by the audience.

A new idea cropping up for Management Week is to break up the groups by trades, getting together and discussing their management problems. This is because business interests are varied and what applies to one trade does not necessarily apply to the problems of another, although they have much in common. So that, by unifying the groups for a general discussion and then segregating the trades, greater interest can be maintained throughout the country and Management Week can be made the vehicle for national betterment in commerce and industry.

A map of the United States, drawn up to show where meetings have been held and how successful they have been, indicates that, although meetings were thickly scattered throughout the east and on the west coast, the intervening portion of the country showed thinly scattered lines, this proving that the manufacturing centers were interested in management problems rather than the wholesalers and retailers.

This is not surprising, however, when one considers that the original scheme was hatched of the fertile brains of industrial executives, and that Management Week still is primarily a discussion of how the producer can increase efficiency in plant management, how to cut down waste in distribution, progress in waste elimination, and budgetary control of expenditures; and a theme for the future, no doubt, will be How, When and Where to Buy Raw Materials, a purchasing problem for industry. The themes covered from 1922 to date have been along manufacturing and industrial lines, because they are the backbone of the nation's business.

In 1922, when the idea was founded, numerous meetings were held in prominent centers of the country. This number increased gradually so that 80 cities were represented in 1925, with 115 meetings held and with 16,000 in attendance; while 250 meetings in 1926 showed an attendance of 30,000. In 1927, 120 cities held meetings with an attendance of about 35,000, and the degree of interest manifested and the high quality of the addresses made a much better showing than theretofore. Still more meetings were held in 1927, from one to six meetings being held in one week in many cities.

No meetings were held last year because the usual October meeting fell in presidential election year. A change was made to April, as this month obviates certain disadvantages during October. The month of April was considered the most generally convenient time for management meetings throughout the country.

An interesting phase of the evolution of Management Week is a general discussion in open forums of local problems and how to handle them. The tendency at recent meetings has been to get away from abstract matters and into the discussion of concrete things. In previous years the

discussion assumed the shape of generalities but in recent years speakers have begun to discuss practical examples and certain phases of good management.

Of course, there is no capital behind Management Week. The meetings are purely of local color and their success depends largely upon the work of local volunteer committees in every city that holds a public and a general meeting to discuss a theme of local interest and value.

It is interesting to note how different cities conduct these meetings, both as to capital expense and as to the degree of enthusiasm aroused. The expense has varied from as high as $2.50 per capita to as little as $2.50 for all the expenses of the meetings. The success of each venture depends, of course, upon the local chairman. Some men who are invited to take the lead accept with great gusto and then fail completely in putting it over, while on the other hand live-wire leaders carry meetings through with wonderful success.

The letters received in the past have been very enthusiastic—even from places where only 30 or 40 men gathered together—as it was felt that an excellent ground-work had been laid and that, next year, things could be done in a much bigger way.

Just how does Management Week get under way? Local committees are usually formed in various cities for the purpose of giving management week the necessary general momentum and for the purpose of making financial arrangements for the meetings.

The incentive to form these local committees usually comes from local groups of the sponsor societies or from local chambers of commerce. The advantages are that a large meeting can be arranged in this way and, if desirable, the time of visiting speakers can be used profitably at a number of local group meetings. The local committee then makes all the financial arrangements for the meeting. All local obligations must be borne by the committee and its local sponsors. Meeting places can usually be secured without charge, from local organizations, so that the only expense is that for local publicity and the cost of circulating announcements. Speakers of consequence usually donate their services.

Organizations which usually back these local committees are chapters or sections of national societies that have sponsored the movement, local chambers of commerce, business men's clubs, executive clubs, engineers' clubs, employment managers, purchasing agents, foremen's clubs, sales managers' clubs, local labor leaders, colleges, universities and schools.

At least one general meeting is held in each city, to which all groups are invited. In live-wire cities there have been as high as eight meetings a day, or fifty during Management Week, and keen zest is developed in the discussions and open forums.

In previous years the National Committee—which starts the ball a-rolling and is composed of one representative of each sponsor organization—selected a topic for the week and acted as a clearing house for local committees. However, the growth of the movement has made this work become too burdensome on the National Committee, so this year cities are urged to select their own topics. During some one week in April their attention is to be focused on the question of management.

Considering the voluntary feature of Management Week, it is astonishing what excellent results are being obtained. The movement is gaining momentum from year to year. Discussions in the past have embraced forward-looking objectives such as the wider use of labor-saving machines; more general applications of modern management methods; greater concentration on the mechanics of waste elimination; more effective cooperation between business men, industrial leaders, engineers, and workers, thereby promoting a better general understanding of business economics.

Stone Quarrying Costs

At the request of a group of operators, the Building Materials Section of the United States Bureau of Mines, Department of Commerce, early in 1928, sent questionnaires to operators of over 1600 quarries, requesting detailed cost information. Completed returns have been received representing roughly 50 per cent of the country's annual production of stone. Many other returns have been promised but as they are coming in rather slowly compilations of a preliminary nature are being made from data now available, in order to acquaint the operators with the significant facts brought out by such a study.

It is probable that this advance outline of the benefits that may result from a study of costs will induce those operators who have not yet made their returns to do so in order that final compilation may be made at an early date. It is obvious that the more nearly complete the returns, the more accurate, and therefore the more valuable will be the results.

They All Read It

"We know of no one who does not already get PIT AND QUARRY in this section."

(Signed) Robertson & Eldredge.

Humanity and the Machine

By DR. DEXTER S. KIMBALL*
Dean of Engineering of Cornell University

YOU all must know there are many people who are greatly concerned about the present-day which they term "machine civilization." You can hardly take up a magazine without reading some article predicting dire things if this tendency continues, and I believe I can do no better than to try to point out some of these tendencies, some of these movements, some of these predictions, and their answer.

The most important event in recent times has been the rise of United States financially and also as a leader of finance, but particularly industrially.

The industrial development in the United States in the last 75 years surpasses anything the world has ever seen. In 1850, the first census that was taken in this country gave the per capita wealth as $383.00. Last year, the estimates made for the census showed a total wealth of the United States of $400,000,000,000 which approaches $4,000.00 per capita, an income of $90,000,000,000 and a wide-spread distribution of wealth.

After you walk around the problem, you come back to a few simple conclusions. First, this great wealth comes from the use of modern methods, from a population willing to work, and from a growing disposition on the part of those who employ to distribute that wealth more fairly.

Now this development of wealth comes down to us through many sources, and I am going to consider the four principal factors, and try to give some measure of the speed with which this thing goes, because it is not so much the possession of this wealth, but it is the speed that worries people.

The first lathe built in about 1800, could be carried by one man. Today, standard lathes 10 feet in diameter with 40 foot centers are used commonly in boring mills. If we wanted a mill that would mill up to 100 feet, we could have it.

Next comes power. When the Centennial Exposition was organized, George Corliss built an engine to drive the Exposition which was so large and important that the President of the United States went there and turned on the steam. It was 1400 horse power. In 1900, twenty-four years afterwards, the General Electric built its first turbo generator, 5000 kilowatt. Today, if you speak of turbo generators, they may be 50,000 kilowatt. The Detroit-Edison has a 60,000 kilowatt machine. There is one compound machine that is high and low turbine of 100,000 kilowatts, and there is under construction at the present time, a machine for the new State Line plant of the Chicago Edison, a compound machine of 208,000 kilowatts. And that power house, when completed, will have a total capacity of a million kilowatts. That is to say, in twenty-five years, we have gone from 5000 to 200,000 kilowatts.

Transportation is one of the four great factors. The first locomotive weighed about four tons. The modern freight locomotive weighs about 400 tons. I do not need to tell you about the size of the ships, except to point out to you there is now being built in Ireland, some trans-Atlantic liners which are a thousand feet long. There are two of them and they will cross the ocean in four days. How big the locomotives will be in the next era, how big the steamships will be in the next era, we can only guess. There never was as much money in the world before and you will have more money for roads if you keep on in the way you are.

Now we come to the last factor—communication. The founder of Cornell University was one of the men concerned with the development of telegraphy. It is not so many years ago that we were carrying letters by horse-back to the Pacific Coast. Then came the telegraph; then the telephone; and then the radio, and what next?

If you will follow a magazine like "Harpers" or "Century" or the "Atlantic Monthly," you will hardly find an issue that some man does not come out and comment and raise his hand to high Heaven and wonder what is happening to the social, political life of this nation, all based on these gigantic changes.

It was almost a foregone thing that men who could make these great developments, who could apply the methods of research, would automatically turn their attention to the applications of the same things to social and political problems. Let me give you a few of the new ideas coming into the field of economics.

The theory of the distribution of wealth started a couple of hundred years ago when Adam Smith wrote the first modern book. It has since become classic and is still taught, in certain respects followed, by a group of English economists who elaborated the theory, which is still being taught in some schools, one of the basic things of which is, that low cost goes with low wages. That is fairly well believed and still talked about, but it does not seem to be true except in the handicraft situation where men work with their hands.

If you have a 40-foot boring mill in your plant, it would make very little difference to you whether

* Abstract of an Address before the National Crushed Stone Association, Cleveland, Ohio.

you paid $5.00, $6.00, or $8.00 a day to the man who runs it, compared to the problem whether he can keep the mill going and get out the full capacity. The wages of the man may be a trifling thing compared to the interest on investment and the money you pay to keep the mill going. Machinery, tools, etc., have changed all those ideas.

At about the same time that Henry Ford made his minimum wage $5.00 per day, there appeared a pamphlet of about eight pages, by Magnus Alexander, on "The Cost of Hiring and Firing Men." It is one of the occasional studies that some fellow makes that changes our viewpoints. He had access to a number of plants, including the General Electric, employing about 15,000, down to small plants employing about 200 men. He made a study of what we now call labor turnover.

In the pamphlet, he pointed out that the cost was about $150.00 pre-war price, to hire and fire a good mechanic. Careful investigations by other men have indicated he was away low, and today, the cost of hiring and firing a good mechanic is way beyond $150.00. Put the two things together —the Henry Ford episode and this pamphlet, and get a new picture of the wage problem.

If Henry Ford reduced his labor turnover 10 or 15 per cent, he made a lot of money, and that is just what happened. That is new economics. There will be in the next twenty-five years a new version of industry so far as those items are concerned.

On the campus of Cornell there is a professor of economics, born in Vermont, of Scotch descent. I met him some years ago, and I talked with him a great deal because I get a lot from him. He is a wise man, and he had found that we were $5,000,000,000 in debt for automobiles, diamonds, radios and things of that kind, and if anything should happen, this whole structure would go down like a house of cards. I saw him the following summer and he told me that he was employed in a bank, and he was not so much disturbed.

He said, "I am amazed to find that the savings accounts in this country are increasing constantly. They are going up all the time."

I said, "What about that $5,000,000,000 we are in debt?"

"Oh," he said, "I am not so much alarmed about that. I find that all the time the debt is being paid up."

The General Motors put a large sum of money into the hands of Professor Seligman, of Columbia, and he has issued two big volumes on deferred payments—they used to be called "Installment payments," but now they are called "Deferred payments" or "Purchasing on account." He has issued two big thick books, and one of his conclusions is that after all that is a good economic policy. That it is just as reasonable to extend credit to the man on the street, as it is to extend credit to the farmer or to the importer. Those are new tendencies that have come out of that thing that you helped to create.

I think even more startling still is the change that is coming in regard to government based upon these new ideals. We inherited the old English Common Law, and that old law runs something like this: If a man were injured, he got a lawyer and if he could prove two things—first, that he had not been guilty of negligence—he did not stick his finger in the machine and cut it off—and if he could prove that his co-workers were not guilty of contributory negligence—that they did not stick his finger in for him—he had a chance to recover damages.

Over night that whole thing was wiped out, and you have your new compensation act. There is no precedent. There is nothing like it in the old English Common Law that we knew. It is an indication of the new viewpoint in regard to human knowledge.

But I think more interesting still is the doubt that is being cast in our minds on the use of what we call the "jury system" by people who have lived in industry. The jury system is something like this: If anything happens, you call in twelve good men and true, and they hear the evidence and they return a verdict according to the evidence.

If there is a bridge at issue, you call a jury of engineers. If a man's leg is broken, you cannot call in a jury to decide what is the matter with it. You must have a jury of doctors.

There has come into our whole method of thinking these new notions that have come from exactly the new idea of road building. The old idea of road building was to scrape all the mud up into the middle of the road two or three times a year. Modern road building is just as different from the old method of road building, as the old jury system from this present one we have got to adopt.

There have been three great forms of ideals since the world began. The first is that life is not worth while; that nobody can be happy—and there are still many people who believe that. The second one is that a few people can be made happy and comfortable, but that the majority cannot. That lies at the basis of slavery, and the ancient civilization, with no other tools but handicraft, but now comes a new ideal. Here comes the engineer, and the word "engineer" includes all of us who have come so close to conquering our environment that it looks as though all people could be happy, I mean comfortable, fed, clothed, housed and educated.

We believe that all men, women and children should have enough to eat, drink, should have education, mental and moral uplift. This is the first civilization that ever said that every boy and girl should be educated. Many of them said that they

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January Construction Contracts Show Moderate Decline

Total construction contracts awarded during January in the 37 states east of the Rocky Mountains amounted to $409,967,900, according to F. W. Dodge Corporation. These states include about 91 per cent of the total construction volume of the country. When the above figure was compared with the total for the corresponding month of last year there was a decrease of 4 per cent and when compared with the total for December, 1928, there was a 5 per cent decrease.

Analysis of the January contract total showed the following important classes of work: $138,068,600, or 34 per cent of all construction, for residential buildings; $100,378,000, or 25 per cent, for commercial buildings; $66,522,000, or 17 per cent, for public works and utilities; and $63,108,900, or 16 per cent, for industrial projects.

During the month of January there was $818,284,000 worth of new projects reported in contemplation in the 37 Eastern States. The above figure was 13 per cent ahead of the amount reported in December, 1928, but there was a drop of 10 per cent, from the amount reported in January of last year.

New York State and Northern New Jersey

New building and engineering work started in New York State and Northern New Jersey during the month of January amounted to $101,684,200. This figure was 26 per cent less than the total for December of last year and there was a decrease of 22 per cent from the January, 1928, total.

Included in last month's contract total were the following important classes of work: $45,770,000, or 45 per cent of all construction, for residential buildings; $20,827,500, or 20 per cent, for commercial buildings; $20,492,100, or 20 per cent, for public works and utilities; and $5,941,800, or 6 per cent, for educational projects.

During the past month there was $162,308,900 worth of new contemplated projects reported in this area. The above figure was 17 per cent under the amount reported in the preceding month and it was 47 per cent less than the amount reported in January of last year.

New England States

January construction contracts let in the New England States amounted to $29,318,400. This figure exceeded the December, 1928, record by 4 per cent, but it was 19 per cent less than the total for January of last year.

The following were the most important items in the January building and engineering record: $11,894,900, or 41 per cent of all construction, for residential buildings; $10,088,200, or 34 per cent, for commercial buildings; $1,641,500, or 6 per cent, for educational projects; and $1,495,800, or 5 per cent, for industrial projects.

New contemplated work reported last month in the New England states reached a total of $54,348,300. This figure represents an increase of 43 per cent over the amount reported in December, 1928, but there was a loss of 2 per cent from the amount reported in January, 1928.

Middle Atlantic States

The Middle Atlantic States (Eastern Pennsylvania, Southern New Jersey, Maryland, Delaware, District of Columbia and Virginia) had $49,083,400 in contracts for new building and engineering work during January. Last months' total was 6 per cent less than that for December, 1928, and it was 4 per cent below the total for January of last year.

Analysis of the January contract record showed the following items of note: $20,473,100, or 42 per cent of the total, for residential buildings; $16,803,000, or 34 per cent, for commercial buildings; $3,631,900, or 7 per cent, for industrial projects; and $2,819,400, or 6 per cent, for public works and utilities.

Contemplated new work reported in January in the Middle Atlantic States reached a total of $134,296,600, being a gain of 19 per cent over the amount reported in the corresponding month of a year ago, but a loss of 1 per cent from the amount reported in December, 1928.

The Pittsburgh District

January construction contracts awarded in the Pittsburgh District (Western Pennsylvania, West Virginia, Ohio and Kentucky) amounted to $57,108,300. This is the largest amount ever recorded in this district for the month of January. It was more than double the January, 1928, total and it was 46 per cent ahead of the total for December, 1928. The awarding of a large contract for a power plant to be constructed in the state of Pennsylvania helped to make the above record.

Last month's contract total included the following important items: $24,870,000, or 44 per cent of all construction, for industrial projects; $11,832,300, or 21 per cent, for residential buildings; $10,245,800, or 18 per cent, for public works and utilities; and $4,729,200, or 8 per cent, for commercial buildings.

The Pittsburgh District had $139,418,000 worth of reported contemplated work during the past month. This figure was more than three times greater than the amount reported in the preceding month and it was 50 per cent ahead of the total for January of last year.

The Central West

The Central West (Illinois, Indiana, Iowa, Wisconsin, Southern Michigan, Missouri, Kansas, Oklahoma and Nebraska) had $113,171,000 in contracts for new construction work during the past month. The above figure was almost the same as the January, 1928, record, but there was a loss of 6 per cent from the December, 1928, total.

Included in the January building and engineering record were the following classes of importance: $37,555,600, or 33 per cent, for commercial buildings; $33,966,100, or 30 per cent, for residential buildings; $18,026,200, or 16 per cent, for public works and utilities; and $13,877,700, or 12 per cent, for industrial projects.

New projects reported as contemplated during the past month in the Central West amounted to $214,107,000. There was a drop of 1 per cent from the amount reported in the preceding month and there was a 4 per cent decrease from the amount reported in January of last year.

The Northwest

Building and engineering contracts were let last month in the Northwest (Minnesota, the Dakotas and Northern Michigan) to the amount of $6,220,900. This figure was the second highest January contract total on record for this district. It was more than double the amount contracted for in January of last year and it was 63 per cent ahead of the amount contracted for in December, 1928.

The following were the most important items in the January contract record: $4,457,800, or 72 per cent of all construction, for commercial buildings; $798,200, or 13 per cent, for public works and utilities; $483,400, or 8 per cent, for residential buildings; and $250,000, or 4 per cent, for social and recreational projects.

New contemplated projects reported last month in the Northwest reached a total of $12,430,500. There were increases of 36 per cent over the December, 1928, total and of 78 per cent over the January, 1928, total.

Southeastern States

January construction contracts let in the Southeastern States (the Carolinas, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas and Louisiana) amounted to $37,482,400. There was an increase of 11 per cent over the total for the preceding month, but there was a drop of 20 per cent from the January, 1928, total.

Analysis of last month's building and engineering record showed the following items of note: $8,520,700, or 23 per cent of all construction, for public works and utilities; $8,441,800, or 23 per cent, for residential buildings; $14,145,500, or 38 per cent, for industrial projects; and $4,182,400, or 11 per cent, for commercial buildings.

Contemplated new work reported last month in the Southeastern States reached a total of $63,182,400. This figure was 10 per cent ahead of the amount reported in December, 1928, but there was a 3 per cent decrease from the amount reported in January of last year.

Texas

The state of Texas had $15,899,300 in contracts for new building and engineering work during the past month. The above figure was 6 per cent below the total for December, 1928, and there was a drop of 4 per cent from the total for January, 1928.

Included in the January construction records were the following items of interest: $5,207,000, or 33 per cent of the total, for residential buildings; $4,710,700, or 30 per cent, for public works and utilities; $2,669,900, or 17 per cent, for industrial projects; and $1,734,300, or 11 per cent, for commercial buildings.

New contemplated projects reported during January in this state amounted to $38,192,300. There was an increase of 17 per cent over the amount reported in December, 1928, but there was a loss reported in December, 1928.

Humanity and the Machine

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ought to be educated, but we go farther: We say that every boy and girl must be educated, because we know that we can afford it. There is not a state in the Union but that has compulsory education.

Some years ago Stokes, who for many years carried on uplift work in New York City, quit his work, gave up his institution and went into the field of politics. I asked him why he gave up that work.

He said, "Because I do not believe it will ever be possible to elevate the entire group, mentally and morally until the industrial background is made right, and as the industrial background is made right, all of these follow."

Now I am giving you the off-setting evidence that you do not get from magazine articles: that the thing is just as plain as can be. We have only started to develop the industrial wealth of this nation. As the industrial wealth goes up, apparently our desire to use it better grows apace.

In other words we have come a long way from the old ideal that money is a terrible thing, an upsetting thing—the source of all evil. Wealth and industrial development is the basis of all things that are good, and if we keep going along the lines indicated with the speed that we are going, there is no doubt at all that our children will see a civilization where there will be enough to eat, drink, wear —food, clothing and shelter and industrial moral uplift. My viewpoint, therefore, is that all concerned with this great industrial development can feel justly proud of our work.

Lime as Produced for the Canadian Market

By BRUCE C. MATSON*

Beachville White Lime Company, Beachville, Ontario

LIMESTONE is generally defined as a rock in which Calcium Carbonate is the chief ingredient. The commercial definition adopted by the National Lime Association, however, includes specific limits of the Calcium and magnesium carbonate content by stating that limestone is a rock varying in composition when free from impurities, from pure calcium carbonate to a mixture of 54.35 per cent calcium carbonate and 45.65 per cent magnesium carbonate.

There are no limestones, in sufficient quantities for Commercial use that are without some impurities which occur either in chemical composition with the calcium and magnesium carbonates or as separate minerals. The most common impurities are iron carbonates, iron oxides and sulphides, silica, alumina, phosphorus and carbonaceous matter. It is due to these impurities that limestones obtain the various colors ranging through drab, yellow, blue and brown.

Sand-lime Brick, as the name implies, requires for its manufacture those two ingredients, Sand and Lime. Thus huge quantities of both materials are annually consumed in the industry, the differential in cost makes them economically of almost equal importance. It is therefore through the judicious choice and use of both sand and lime that large savings of money and increased quality of brick must be expected. It seems then necessary that the Sand-lime Brick Manufacturer should have as great a knowledge as possible of the two industries from which he must procure his raw material. With this in view, this paper limited, as it necessarily must be, has been written for the Sand Lime Brick Association in hopes that it may present some preliminary ideas on lime which may be of value.—Author.

Limestones include many and widely varying types of rocks, differing in origin, color, texture, hardness, structure and composition. Industrial classifications are not usually made by methods of deposition, but according to either texture or chemical composition. The classifications according to texture are mostly self-explanatory and run as follows: Compact, crystalline, oolitic, fossiliferous, shell limestone, chalky, conglomerate, cherty, stalactitic or stalagmitic.

Classification according to chemical composition embraces the following:

(a)—High calcium limestone carries 93 per cent to more than 99 per cent $CaCo_3$.

(b)—Magnesium limestone, containing $MgCo_3$ in any quantity up to 45.65 per cent.

(c)—Dolomite is a mineral composed of the double carbonate ($CaCo_3$ $MgCo_3$). It contains 54.35 per cent $CaCo_3$ and 45.65 per cent $MgCo_3$.

In practice any limestone containing 20 per cent or over is called a dolomite.

(d)—Argillaceous limestone contains a considerable proportion of clayey material principally silicate of alumina.

(e)—Arenaceous and siliceous limestones, contain fine silica sand.

The title of this paper was chosen not because of any vast differences in the raw materials and methods of manufacture in Canada than in the United States but rather because it is written from a Canadian point of view. Mother nature in laying down her deposits of limestone did not recognize the boundary line which exists between ourselves and our neighbors to the South.

The public generally has a much mistaken idea of the extent of the distribution of limestone rock seeming to hold the opinion that one can settle almost anywhere upon lime rock. This mistaken idea is substantiated in the United States by Geological Surveys that show that limestone deposits both high calcium and magnesian embrace an area of only 15 per cent of the country. Of this area the vast proportion does not outcrop and that which does is only accessible in rare instances to be worked successfully on a commercial basis.

In Canada, a recent survey made the C. P. R. shows that both high calcium limestones and dolomites occur in abundance and are used for the manufacture of lime in the provinces of Nova Scotia, New Brunswick, Ontario and Manitoba. In Quebec and British Columbia, high calcium limestones only are utilized for lime, the magnesian limestone being either impure or in districts remote from transportation. No lime is produced in Prince Edward Island or Saskatchewan.

Although compared with production in the United States our manufacture of lime is small, yet statistics show an encouraging annual increase in both hydrated and lump lime. Whereas in 1924 Canada produced some 8,000,000 bushels, this was increased in 1927 to some 10,500,000 bushels or roughly an increase of 25 per cent with prices remaining to all intents and purposes, constant, 1927 giving Canadian producers an average price of 28.9c per bushel for quicklime and $11.81 per ton for hydrated lime.

Canada boasts at the present time some 60 lime plants distributed from coast to coast. This list

* Abstract of paper presented before the Sand Lime Brick Association, Mayflower Hotel, Washington, D. C.

would of course not include those too numerous to mention, small pot or batch kiln producing 2 to 4 tons of lime at each burning, but rather means plants of more recent design of the continuous operation type, vertical or rotary. The majority of the large lime plants are equipped with externally-fired, vertical, continuous kilns, and use wood, coal or gas as fuel. The older types are constructed of stone and lined with fire brick; the new types are of steel lined with brick. The capacities of these kilns range from 10 to 20 tons of lime per day each. Within the last few years the rotary kiln has received more attention. One large manufacturing concern burning lime for its own use, at the time of the last Government report had three of these kilns in operation producing some 100,000 tons during the year, but at the time of writing has installed three new units which will give an estimated 200,000 tons per annum.

Some 16 of the above plants have installed equipment to produce commercial hydrated lime. Practically all plants are using well known American hydrating machinery of either the continuous or batch type. In 1927, Canada produced some 71,000 tons of hydrated lime.

Recently considerable investigation has been made into European lime burning practice, which in many instances differs slightly from American methods. Canada has followed the lead of the United States in design and operation, indeed using largely, equipment of American manufacture.

It has been suggested that this paper should include a resume of lime burning practice. For this purpose much of the material has been collected and sifted to form a brief picture from the works of such authorities as E. P. Burchard, W. E. Emley, E. C. Eckels and N. V. S. Knibbs, with some extracts from reports of the National Lime Association.

Lime Burning

Any kind of limestone is suitable for burning, so far as its physical properties are concerned. These influence the cost of production noticeably. Fine grained, dense stone can be burned at a lower temperature and with less heat than one which is coarsely crystalline and porous. Coarse stone especially if pure, is likely to fall to pieces in the kiln, reducing the production of lump. Water contained in limestone must be evaporated.

In burning lime three factors are essential: (1) The stone must be heated to the temperature of dissociation of the carbonates; (2) this temperature must be maintained for a certain length of time. (3) The carbon dioxide evolved must be removed. The dissociation temperature for calcium carbonate is 898°C. That for magnesium carbonate may be taken as 750°C.

The chemical action involved in burning lime is reversible, and the factor which determines the way the reaction shall go is the pressure of carbon dioxide. To prevent recarbonating it is essential that the gas produced be removed rapidly and continuously.

The first actual kiln that we know of is the "flare" kiln. In its earliest form the flare kiln consisted merely of a pile of limestone built loosely over a pile of wood. The wood was lighted and when it had burned out the pile was demolished and the lime separated from the unburnt stone. Large quantities of lime are still made by this process in China. An improvement made later was the provision of permanent walls of limestone within which the wood and stone were piled. The lime produced was of good quality but the process was very costly.

The next development was the "mixed feed" or "Pot" kiln. It consists of a vertical shaft of circular or other cross sections onto which limestone and fuel are charged in alternate layers. Lime and coal are withdrawn at the bottom and separated as well as possible by sorting. If operated properly the method is economical but high quality lime cannot be made even with the most careful separation of the fuel ash. In Great Britain this method is still used extensively.

To eliminate the major disadvantages of the mixed feed kiln, the vertical shaft type with exterior firing, sometimes called the "patent" kiln was devised. It is with this kiln in its various forms in which we are mainly interested.

In general, a shaft kiln resembles a short, wide stack of either square, round or elliptical cross section. It consists of a casing of steel or stone which is lined with refractory material. The long, vertical chamber formed by the lining may be divided into three compartments by imaginary horizontal planes. The top compartment called the hopper, is used for storing and preheating the stone. Its sides slope in so that the stone may slide down into the middle compartment, the shaft. This shaft is the place where the lime is burned. It may be of either square, round or elliptical cross section, independently of the outside of the kiln. Generally the sides of the shaft are vertical, although in some cases they slope outward. In this latter method of construction it is customary to omit the hopper. At the bottom of the shaft the third compartment (the cooler) is used for storing the lime after it is burned. The top of the cooler must have the same cross section as the shaft. The sides are drawn in to form a slide leading to the drawing door. A hole in the side or bottom of the cooler is closed by a door or by sheets of iron which swing on a pivot and are known as shears. The lime is removed through this opening.

The fuel used, wood, coal or gas as the case may be, in burning the lime is consumed in the fire boxes usually arranged on two sides of the kiln.

They are similar to the common fire boxes in use under boilers. Each kiln has two or more, which are set in openings through the casing and lining into the lower part of the shaft—when gas is used as fuel, the fire box is a mere port through which the gas pipe is led into the kiln. In either case the draft caused by the combustion of the fuel draws the flame up through this shaft in direct contact with the lime and stone and the gases formed pass out the top of the hopper. To increase this natural draft a stack is sometimes placed on top of the kiln. Forced or induced draft, or a combination of both, is also in common use. The forced draft is generally created by blowing steam through the grates into the fire box; the induced draft by drawing the gas out through the top with a fan. These two methods may be combined, or the gas which is drawn from the top may be forced back through the grates, according to the Eldred process. These methods of increasing the draft have in some cases necessitated closing the top of the kiln. Hence a charging door must be supplied through which the stone can be dumped.

There are many considerations which limit the practical size of a kiln. Chief of these is probably the market which the kiln has to supply. If the market demands a definite supply of lime for a continuous period, a kiln can be built large enough to supply the demand. Generally, it is safer to build a number of small kilns so that if the demand falls off, it will not be necessary to close the entire plant. Many plants have installed hydrating plants to hydrate the excess over the market demand for lump as hydrate may be stored. The cross section of the shaft is limited by the distance the heat can be made to penetrate towards the center. The total height of the kiln above the grates is limited by the conditions of the draft. If natural draft is used, the gases must leave the top of the kilns hot enough to produce the draft. That is the kiln must not be too high, or the stone will absorb too much heat from the gases. With any form of induced draft, the kiln should be just high enough for the gases to leave it approximately at the temperature of the external air. If the kiln is lower than this, the heat carried off by the gases is simply wasted; if higher the added quantity of stone causes unnecessary work for the fan.

The casing of the kiln is sometimes built of stone or concrete, instead of steel. These materials probably diminish the amount of heat lost through the kiln wall but the casing should be designed primarily for strength. Most of the strain is found to be lateral, which tends to push the stone out. It is resisted much better by steel. Reinforced concrete when properly designed, should combine the strength of the steel with the heat insulating properties of the stone and is therefore finding favor in modern construction.

Operation

Shaft kilns are commonly operated by two methods—namely, the "following" and the "sticking" processes. By either process only part of the lime is taken out at a time, since enough must remain to fill the cooler and so keep the unburned stone above the level of the grates. The "following" method is simple. When the lime is drawn from the bottom of the kiln the remaining lime and stone slide down and fill up the space, as would naturally be expected. The difficulty with the process lies in the fact that the stone will not burn evenly owing to the tendency of the flame and hot gases to pass up the side of the shaft, rather than in the center, the mass of unburned stone always extends down farther in the center than at the sides. It is customary to draw out enough lime to permit the lowest part of the stone to reach the grate level.

In the "sticking" process the kiln is generally chilled by omitting to fire and leaving the fire doors open for from twenty minutes to one hour before drawing. This chilling causes a contraction of the lining and also a solidification of the fused compounds resulting from the action of the lime on the lining. When the lime is drawn from the cooler, these two processes, acting together, prevent the stone from following and cause it to stick or hang. After drawing the lime is knocked down by bars, inserted through the fire boxes, and finally the whole mass is caused to fall by knocking the supporting pillar of lime away.

Rotary Kilns

The rotary kilns, used so largely in the cement industry have in recent years been applied to the burning of limestone. While the vertical kiln is fed with lumps varying from 4 to 12 inches in diameter, the rotary kiln takes stone broken preferably to from ½ inch to 2 inches in size. It is therefore adapted to deal with the stone from the quarry which could not be used in a vertical kiln; while on the other hand it is impossible to produce large lump lime in a rotary kiln.

This kiln is essentially a steel cylinder 6 to 9 feet in diameter and 60 to 100 feet long, which is supported on trunnions and rotated. It is set in a slightly inclined position, the inclination being usually about one-half inch to the foot. The rotating section is lined with some type of non-abrasive fire resisting material. The crushed lime rock is fed into the upper end of the kiln, while the fuel, may be powdered coal, oil or gas, is forced in at the lower end. A draft is maintained usually by means of a fan. As the stone passes through the kiln, it is burned and, at the lower end, drops into a cooler, which is a rotating steel cylinder, but much shorter than the kiln. Cooling of the lime is effected by exposing it freely to the air in the second cylinder.

Effect of Accident Prevention

(*Continued from page* 52)

The first thing to do after that man left the plant was to fill his position. We could not take an unskilled laborer and put him on a jackhammer. The only available man who had had any experience with the jackhammer was at that time helping on a well drill. We brought that man and put him on the jackhammer. Then we had to fill his position. In order to do that, we took a chap who had been helping load cars and put him on the well drill. Then we got an ordinary laboring man and put him on helping load cars. So we crippled up three positions in order to fill one. And none of those were filled with operators as efficient as the ones whose positions they had taken.

In this particular case, it happened the only relative this man had in this country was a brother, who was employed at the plant as a blaster. Naturally, on account of the seriousness of the injury, the brother wanted to go to the hospital. That made it necessary to fill some more positions. We moved his helper up into the position of blaster, got a young fellow from the Ameisite plant and put him in to help the blaster, put an unskilled laborer on the Ameisite plant. There were three positions crippled in order to fill those. And none of the employes that we put in those places were as efficient as the men whose positions they had taken. So the production was naturally retarded.

After a day or so, we began to adjust ourselves to conditions. Then we found a lot of contention among the jackhammer men in particular. The feeling existed among them as to whether they were in as much danger as Patsy had been. That feeling of timidness developed sometimes in them to absolute fear, and it is a pretty hard matter to convince those fellows that they are safe at times when they really were safe. So the production suffers in every way from an accident, and I do not see anything on the other side to argue. There certainly is not any reason for production to be increased by accidents.

We find that accidents cannot occur without destroying the morale of the entire plant.

Early Planning Urged For Roads, Streets

With automobile usage still rapidly increasing and the street and road daily becoming of more importance, the desirability of making highway construction plans early is apparent.

Highway engineers are urging that plans be made and contracts be let as early as possible in the winter and spring preceding the construction season. Many communities have gone even further by making definite plans for construction work a full year ahead.

Early planning, it is pointed out, provides ample time for the extensive preparatory work that goes with any sizable project. In building rural pavements old roadways are often shortened for economy's sake, and old and new road beds must be whipped into proper condition before the paving mixer can be used. These operations may call for considerable time.

In city paving, many other items must be considered. Where permanent paving projects are contemplated it is of course highly desirable to place all underground utilities, such as water mains, electric wires, telephone cables and so on, in first class condition in order to avoid the constant tearing up of streets with which so many municipalities are afflicted.

The village of Newark, N. J., after experiencing delays through too late consideration of improvement projects, made early plans one year for paving eight streets. Since it was the off-season for contractors, the keen competition developed among them because of the benefits that would accrue through ample planning time made it possible for Newark to save 21 per cent on the estimated cost of the paving.

So far, the demands of the automobile have been so insistent that not much time for planning has been permitted. Particularly in larger cities, projects planned some time prior to construction have proven inadequate when built.

Three Methods of Blasting

(*Continued from page* 36)

We have continued at these plants with the bench and snake hole drilling, taking advantage of the improvements made by the manufacturers in drilling equipment. Where we formerly drilled holes 18 to 20 ft. with the piston drills tripod-mounted, we now drill 30 ft. holes having the same bottom diameter using the new hammer type drill tripod mounted.

At one of these plants there is the additional consideration of red stone underlying the Trap Rock at varying depths, beginning at about 25 ft. Extreme care must be taken to avoid blasting any of this red stone with the Trap which can best be accomplished by snake hole drillng aind by small tonnage shots.

In conclusion may I point out that although we are quarrying Trap Rock at all of our plants, we find that one type of blasting is not effective. Some of you operators would no doubt find it beneficial to investigate the blasting methods used by other producers of similar stone. The first step in quarrying is the preparation of the stone for the crushers and any improvement over present methods employed should command your attention.

Accounting for Transportation Charges

By J. J. BERLINER

THERE is probably no problem in Cost Accounting concerning which there is so much question as that of how to handle transportation charges such as freight, express, postage, and all such forms. A great many concerns follow the practice of charging all in coming freight to a factory expense account and all out going freight as a sales expense, for no other reason than the assumption that material coming in is used in manufacture and material going is sold. This method is incorrect. The problem of the correct distribution of transportation charges is most important; a full and satisfactory solution must be found if the business is to show cost figures which are at all accurate.

The fact that the material enters the plant is no proof whatever that all in coming transportation charges are a factory expense, as will be explained later. Further than this, even supposing, that all the in coming charges were to apply to material which was to be used in manufacture, the ratio of transportation charges on some material to the price paid to the vendor for the material might be two to one, whereas with some other material the transportation charges might be only one twentieth of the price paid to the vendor for the material. This fact shows how erroneous it is for any industrial organization to throw all in coming transportation charges into an expense account.

The situation is very similar as regards out going transportation charges. While some of them may have to do with sales, others may be for raw material returned as defective, or for many other items which have nothing whatever to do with sales expense.

In coming transportation charges are incurred on the following classes of goods:

1. Purchased goods.
2. Goods returned by customers.
3. Samples, etc., not covered by a purchase order; this case sometimes occurs though it is bad practice.
4. Goods refused or condemned.
5. Receipts of miscellaneous nature.

Purchased Goods—f. o. b. Works of Purchaser

The charges are either prepaid by the shipper, or paid by the purchaser and deducted when settlement is made for the goods. In such cases the straight invoice value is the correct cost of the goods.

F. o. b. Works of Vendor—Freight Allowed

The accounting of the charges is identical with that for "f. o. b. works of purchaser," but the purchaser has the responsibility of pushing all claims for damage with transportation companies, as by the terms the goods belong to the purchaser immediately upon shipment.

F. o. b. Works of Vendor

The firm pays all charges in addition to the invoiced price of the goods. This means that in entering the cost of the materials in question on the price books or stock records, the cost will be the invoice price plus the freight charges.

Goods Returned by Customers—Miscellaneous

Many times goods are returned when ordered in error by customers. Charges on goods returned for this or similar reasons should be recovered from customers when possible but when for selling or other reasons it is thought best to absorb the charges, they may be charged to Miscellaneous Expense Freight.

Goods Returned by Customers on Account of Error

The charges are entered either against a special expense account to show the exact cost of such errors, or against "Miscellaneous Expense Freight." The situation is somewhat the same as in the case of "goods returned on account of error."

Ordinarily there should be no incoming materials other than as specified under other headings, but usually there are isolated instances of samples, etc., coming in which are not covered by purchase orders. In all such cases, the transportation charges should be charged to the expense account receiving the benefit.

Goods Refused or Condemned

Great care should be taken that all transportation charges on goods refused because of error, or because condemned are charged to the shippers. In any case of the fault of the concern, or of doubt, when the concern finally has to pay charges, the charge should be made, not to the material accounts, but to Miscellaneous Expense Freight.

Receipts of Miscellaneous Nature

There are quite often receipts of various materials not otherwise specified. These may consist of traveling men's equipment, exhibits returned from conventions, transfers between offices and plants, and many other items.

In all cases of this nature, either a specially designated miscellaneous expense freight account, or some other expense account, should be charged with cost of transportation. For example, suppose an exhibit is returned from a convention. The freight charges on this should be charged either to an expense heading under selling expense called

"Convention Expense," or an account called "Selling Miscellaneous Freight."

The main point to bear in mind is that it is of no use to throw all charges into one account, but that it is far more valuable to charge all such transportation cost to the expense account which receives the benefit, and which should be increased by the cost of such transportation.

Outgoing Transportation

Transportation on outgoing goods covers:

(1) Shipment of Sales.
(2) Shipments of returned purchased goods.
(3) Shipments of Samples.
(4) Shipments of miscellaneous nature.

Shipments of Sales—f. o. b. Works of Purchaser

In this case either charges may be prepaid or shipment may be made collect, allowance being made for the freight when the customer pays the invoice.

F. o. b. Works of Seller

In this case, the usual procedure is the prepayment of charges to any prepay stations on railroads or express lines and the payment of parcel post charges.

F. o. b. Works of Seller—Freight Allowed

This case is treated like that of "shipment f. o. b. Works of Purchaser," except that the customer has full responsibility for goods immediately on shipment.

Shipments of Returned Purchased Goods—Goods refused or condemned—Out going charges are treated like in coming. Goods Returned Account Buyer's Error—The charges should be made to miscellaneous expense freight.

Shipments of Samples

In most cases of shipments of samples the charges should be made to "Miscellaneous Expense" of the selling department. This does not always hold, however, as in the case of the purchasing department sending out samples of material for duplication. In such instances the charge should be made to Miscellaneous Expense Freight.

Shipments of Miscellaneous Nature

There are many shipments of miscellaneous nature the transportation charges of which should be charged against various expense accounts. For instance, the charges for a bundle of advertising material sent out by express should go to "Advertising Miscellaneous Expense." In the case of a typewriter shipped for repairs, the charge should go to office Sundry Expense, etc.

Accounting for Transportation

Before applying specifically the directions just outlined for handling freight of various kinds, it is necessary to discuss briefly the actual ledger accounts which are affected by the various charges, with a description comprehensive enough to permit of clearly outlining the procedure which should be followed in connection with each class of charges. Almost every control account of any importance in the ledger may at some time or other be charged with some form of transportation. This is especially true in the case of material inventory accounts and expense accounts.

Transportation Charges consist of five main divisions, as follows:

1. Charges to be deducted from payment of invoices, covering freight charges of any nature which are paid by the purchaser of material, etc., but are to be deducted from the settlement for the goods in accordance with the terms of the purchase.

2. Charges to be added to invoice, consisting of whatever may be expended in prepayment of out going shipments, by freight, express, postage, etc., which is to be added to the invoices for the out going goods.

3. Charges to be absorbed in cost of goods, including payment on in coming goods, which have to be added to the invoice cost of the goods in order to determine the real cost delivered at the plant.

4. Charges on delivery of sales, covering transportation charges which have been included in the sales price of goods shipped to customers. These charges are not added to the invoice.

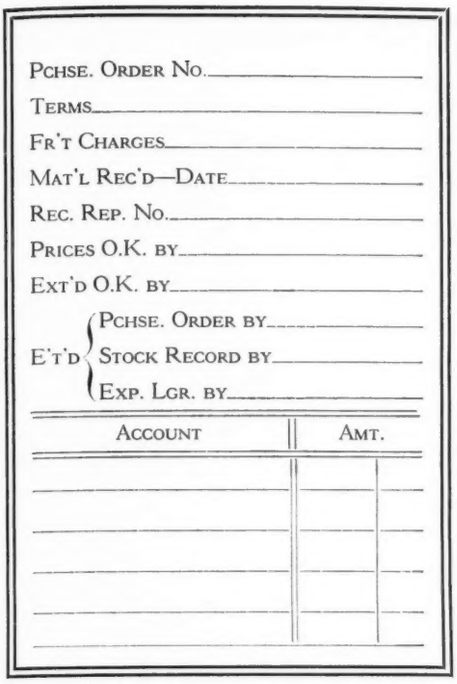
5. Charges of an expense nature, covering a multitude of cases, both in coming and out going, in which the transportation paid is a direct charge to some one of many expense accounts, these expense accounts may be of any nature, perhaps appearing in one of the expense accounts as shown in the standing order code.

To make clear the handling of the charges in these various types of accounts, each class will be taken up separately with reference to the tabulated statement of the various kind of transportation charges.

Charges to be deducted from Payment of Invoices—The charges to be deducted from payment of invoices are of a troublesome nature so far as the accounts are concerned, because of the danger of paying a large volume of in coming freight and failing to deduct the payment from the settlement of the invoices for the goods on which the charges were paid. If accuracy is to be assured, it is necessary to create a holding account for such charges in order to maintain an adequate check and insure that all deductions are properly made.

Freight Bills often have to be passed through and paid a long time before the invoices for the goods arrive. With all freight bills the following method should be used.

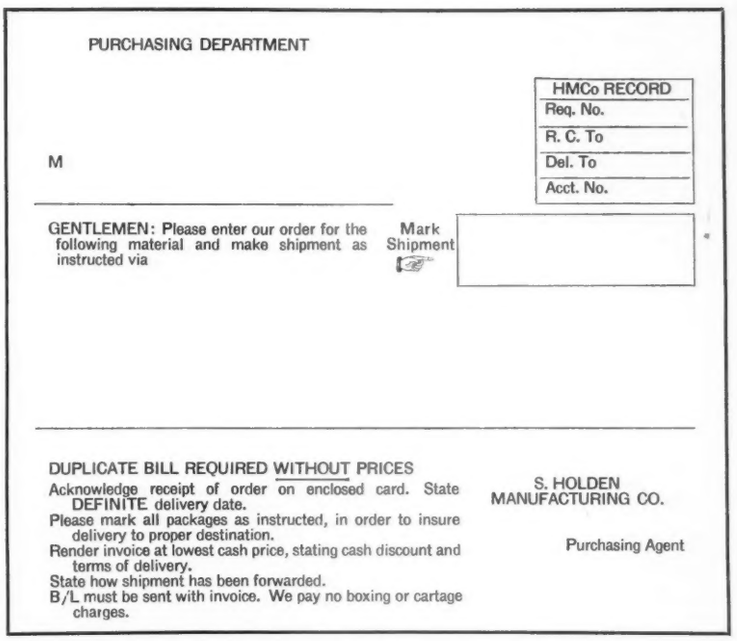
A ledger account should be established called "Freight to be Deducted." This account should be charged with in coming freight which is to be deducted from the vendor's invoices, and credited



PCHSE. ORDER NO._____
TERMS_____
FR'T CHARGES_____
MAT'L REC'D—DATE_____
REC. REP. NO._____
PRICES O.K. BY_____
EXT'D O.K. BY_____
E'T'D { PCHSE. ORDER BY_____ / STOCK RECORD BY_____ / EXP. LGR. BY_____

ACCOUNT	AMT.

Form 1. Invoice Stamp. (Size, 2½ x 3½.)



PURCHASING DEPARTMENT

HMCo RECORD
Req. No.
R. C. To
Del. To
Acct. No.

M

GENTLEMEN: Please enter our order for the following material and make shipment as instructed via

Mark Shipment

DUPLICATE BILL REQUIRED WITHOUT PRICES
Acknowledge receipt of order on enclosed card. State DEFINITE delivery date.
Please mark all packages as instructed, in order to insure delivery to proper destination.
Render invoice at lowest cash price, stating cash discount and terms of delivery.
State how shipment has been forwarded.
B/L must be sent with invoice. We pay no boxing or cartage charges.

S. HOLDEN MANUFACTURING CO.

Purchasing Agent

Form 2. Purchase Order. (Size, 8½ x 11.)

with all deductions made in the cash disbursements book in settlement of these invoices.

A subsidiary book should be kept in which should be entered on the detail of each charge made to the Freight to be Deducted accounting one item to a line, with space alongside each detail entry to permit of a corresponding detail entry made from the cash disbursements book at the time this freight is deducted in settlements.

This procedure, although detailed, has proved many times to be a most profitable feature, bringing about a saving far in excess of the extra cost. When the freight bill comes to the purchasing department for accounting, it is identified as to the purchase order to which it applies. If the goods were purchased "F. O. B. Works of Purchaser," the freight bill is charged to the Freight to be Deducted account, that fact being so noted on the bill. The bill is stamped with a rubber stamp (which see) and the name of the vendor is written entered in the record of material received on the alongside the rubber stamp. This freight is then purchase order (see form 2) and when the invoice is received the terms and the amount of freight paid are filled in on the rubber stamp. This gives the accounting department the full details so that when the settlement is made for invoices of this nature, the proper deductions may be made.

It can now be readily seen that on the subsidiary record of the items in connection with the Freight to be Deducted account, the charges or debit entries which have no credit against them are shown very clearly, and it is possible to make sure that all freight payments of this nature all recovers from the vendors.

In actual practice, this account proves useful in taking care of the transportation charges involved when purchase terms are f. o. b. Works of Purchaser and f. o. b. Works of Vendor freight allowed.

Charges to Be Added to Invoices

If there are many out going shipments involving heavy transportation charges, a method similar to that in the case of freight to be deducted should be used. The method of handling is almost identical with the exception of the fact that the credits to the account—called Freight to be Added account—come through the medium of the sales journal rather than the cash disbursements book.

The Parcel Post is another transportation charge to be reckoned with. For parcel post, it is most advantageous to create a ledger account designated as "out going parcel post account," without keeping the detail of each charge in any subsidiary record. The detail should, however, be provided for by small charge slips, or by some method of noting this information on the shipping order, in order that the invoice department may receive the information necessary to bill the customer properly. In entering the sales the amount of parcel post paid out should be credited to the out going Parcel Post Account.

When shipments are made to the purchaser without prepayment of transportation charges, the deductions for such charges, when the terms of sales prices cover delivery to works of purchaser, should be made through the cash receipts book and should be treated as if the amount had been added to the invoice.

Charges to Be Absorbed in Cost of Goods

In all cases when purchases are made with the transportation terms f. o. b. Works of Vendor, this means that one of two methods prevails:

1. The charges have been prepaid by the shipper and added to the invoice.

2. The receiving concern pays the freight charges.

In the first case the accounting is quite simple, as the entire invoice is charged to the account shown by the purchase order, thereby indicating the freight or other kind of transportation bills involved, the total being used in computing the unit cost of the material.

In the second case the invoice comes in simply billing the goods, and there is in addition a bill for the transportation charges entirely separate from the invoice. In this case the transportation is charged, the amount of freight being shown on the invoice in the rubber stamp. The result is that the stock record department must combine the invoice cost and the transportation cost, and compute therefrom the unit price to be used in charging out the material, which thus represents the cost of the material delivered at the plant.

Charges on Delivery of Sales

Probably there are more errors made in the entry of transportation charges paid out on the delivery of sales to customers than in any other item in connection with transportation charges.

Every factor is in favor of treating the delivery cost of sales as an item which will appear in the profit and loss statement as a deduction from the sales, the resulting figure being the exact amount received for goods at the plant of the shipper.

The majority of industrial concerns have a fixed price for large territories, and for those plants the amount of delivery cost is of extreme importance. It should be clear that including delivery charges in the selling expense, or any other expense, creates a cost to be added to the manufacturing cost which may result in a loss of nearby business.

If a concern were in competition with another concern where operations did not extend very far from the locality in which the plants were operating, and the manufacturing costs were identical, the firm whose operations extended into a large area would lose all local business because of having the selling expense loaded with the cost of long-range transportation. The result would inevitably be a falling off in the nearby trade with an increase in the long-distance trade in as much as the selling prices would be too high nearby and too low for distance points.

It is often argued, too, that prices must be made lower on the distant points, but such policy is a fallacy in that this policy contemplates taking additional selling value from nearby points to make possible the lower prices for distant points. Obviously, that policy cannot continue very long. If a manufacturing firm in the East wishes to maintain sales across the continent and get hold the sales of nearby points, it can do so only because the intrinsic value of the product together with proximity to raw materials, giving it an advantage over western manufacturers, allows it to sell at a price which will absorb the freight charges. In other words, time will soon demonstrate that selling prices at distant points cannot be maintained at the expense of nearby sales.

The procedure in this case is to create for each selling account a companion account to hold the cost of delivery of such sales. This account should be called Freight Out on Sales prefixed by the title of the particular sales account to which it belongs. It would be charged with all freights connected with the delivery of sales, whether prepaid or whether deducted by the customer in settling.

Charges of Expense Nature

Charges of an expense nature are very inclusive, embracing all the items in the tabulated statement of freight charges not already discussed. In this connection, it is best not to try to specify in absolute detail every type of charge, since the tabulated statement (see above) gives a sufficient clue to the various entries of in coming and out going transactions involving transportation charges. The point to observe is that very particular attention should be paid to the distribution of the transportation charges which affect the various expense accounts. If that is done, the problem is merely one of determining carefully which accounts should rightfully be penalized with the charge.

A few instances will illustrate the consideration which should be given to the individual case in order to find the line of least resistance and discontinue bunching freight charges into one or two large accounts that give no clue as to their analytical nature.

A machine tool may break down and have to be returned to the works of the maker for repair. The charge for transportation of this machine back and forth is as much a cost of the repairs to the machine as the actual invoice which is later issued by the firm making the repairs. These charges accordingly should be made to the standing order number covering the repairs of this machine.

Material which a company may have shipped out and which the customer rejects as defective is returned. The charge for transporting this material to the customer—which he will probably bill back, together with the cost of getting the material back to its staring point, should most certainly be charged to the account which holds the cost of defective material.

The transportation charges on samples shipped to customers are undeniably chargeable either to a Samples account or a Miscellaneous Expense account of the selling department.

In conclusion, it must be said that unless transportation charges are properly analyzed, as shown in this article, the cost figures are incorrect.

Lime as Used in Our Product

By D. M. GRAY*

BEFORE going into this subject, may I digress and tell you just a little of the romance of lime. As far back as we can go the pages of history and literature mention frequently this so-called common-place material, lime. In Egypt in 2600 B. C. they were using lime. Shakespeare puts it into his writings, and even before that, Englishmen were hurling lime in the faces of their enemies early in the Thirteenth Century. Such references as these appear often—they are only mentioned to show that there is Romance to this prosaic article. Time will not permit of more detailed references, but I hope you will accept my statement that there is enough background to class lime as a fundamental, essential, and basic material in our every day life.

The lime used in your product, Sand-Lime Brick, comes to you in several forms. When you are ready to put it to use, though, it must be in the state of calcium hydroxide, or, as it is commonly called, hydrated lime. It is with this product and the method of producing it that this paper will be confined.

Your familiarity with the process of manufacture of quick-lime makes a description or details of the burning method involved unnecessary. I should like, though, before going further to have you refresh your memory with the following.

You ask, "What is lime?"

Lime, chemically described as calcium oxide, called also "Quick-lime," is a plastic, highly infusible substance obtained by calcining limestone, shells and other forms of calcium carbonate.

Likewise, your query may be, "What is hydrated lime?"

Hydrated lime, chemically known as calcium hydroxide, is best defined as a dry, flocculent powder resulting from the treatment of calcium oxide or "quick-lime" with sufficient water to satisfy the calcium oxide.

When the sand-lime brick industry was brought to this country, there came with it two methods of slaking lime. One was known as the hydrating system. Briefly described, this process consisted of putting the quick-lime in quenchers or boxes, then adding sufficient water for hydration. This in turn was placed in the cylinders under the newly made brick in order that hydration would be completed by exposure to the steam while the brick were hardening. The results obtained by this method were good, but still there was room for improvement.

The other method was what, for lack of a better name, may be called the silo system. The quicklime, either crushed or ground, was mixed with the dry sand and water added. This mix was allowed to stand in the silo for from two to four or five days to complete the hydration of the lime. It was mixed again and then run through the presses and cylinders in the regular way.

Most of you are familiar with these methods, which avoids the necessity of discussing them further.

The process of the manufacture of hydrated lime has been practically the only improvement in the lime industry worthy of note. It permitted the marketing of a distinctive product with essentially all of the good qualities of quick-lime and with all of the poor features omitted. Since hydrated lime was placed on the market some improvements in the forms of quick-lime have been made.

The modern method of manufacturing hydrated lime depends upon the addition of an exact amount of water to a predetermined exact quantity of quicklime, in either lump, crushed, pebble, or pulverized form, with sufficient and continuous agitation during the process of hydration. By no other method is it possible to produce a hydrate which will contain sufficient combined water to satisfy the demand of the calcium oxide present. It is very important that all of the calcium oxide be in combination with water. If it is not, the hydrate will be unsound, consequently unsuitable for your use, as the unhydrated pieces will cause fracture and ultimate breaking of your brick. In the manufacture of hydrated lime or in your slaking process, you must recognize the fact that the formation of hydrated lime involves a chemical change, demanding the presence of a definite quantity of lime and water, and I might add, an unlimited amount of agitation. As the process is chemical, exacting supervision, the same as in any other chemical process, is necessary.

In any method of hydration an excess of water is used over and above that required to combine chemically with the lime. This excess of water is driven off by the heat generated in slaking. The quantity of water necessary is subject to wide variations since it is dependent upon a number of conditions—the condition and form of the quicklime, the temperature of the water, and the atmosphere. Should too little water be used, some of the lime will not come in contact with it and these particles will not slake and consequently will cause trouble. Too much water results in a damp or wet hydration, which, as you know, is difficult to handle. The addition of the correct amount of water requires the most careful supervision of any of the

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operations in the making of a good hydrate or in the proper slaking of lime. Check this part of your operation every day and avoid trouble.

The two principal processes used by lime manufacturers in the making of hydrated lime are the Clyde and Kritzer Systems. Briefly, the Clyde process consists of discharging a quantity of crushed, pebble, or pulverized lime into a large horizontal pan so mounted that it rotates around its vertical axis. A series of plows are arranged to turn over the mix in the pans. To a weighed amount of quick-lime a predetermined quantity of water is added, and the whole mass agitated by revolving the pan. When the water needed chemically has been taken up and the excess driven off as steam, the hydrated lime is dumped through an opening in the center of the pan. From the pan it is drawn off, separated, and carried by air to bins over the packer. It is then packed on automatic weighing and packing machines and is ready for shipment.

In the Kritzer process the crushed or ground lime and water are separately fed into the upper of a series of enclosed cylinders mounted one on top of the other. The amount of lime is controlled by a screw feeding device and the quantity of water is proportioned by a needle valve. The lime and water are propelled throughout the series of cylinders by means of paddles mounted on a shaft extending through each cylinder. These shafts are rotated by gearing on the outside. Both materials are carried through the whole series of cylinders and the product is discharged from the lower or last cylinder thoroughly hydrated. The lime is then handled and packed in the same manner as explained in the foregoing process.

The excellent brands of hydrated lime being offered by lime manufacturers to plants in your industry, and other chemical industries too, bespeaks the care that is exercised by the producers in making the hydrated lime for your process.

At this time let me extend to you on behalf of lime manufacturers, an invitation for you to present your problems to them. Most of them maintain research laboratories and they will gladly receive an opportunity to serve you. Then, too, I know that any lime manufacturer would welcome a visit from any of you gentlemen to their plant so that you may see not only with what care the lime is produced, but also the amount of supervision that is necessary to give you a product that is satisfactory for your needs. A trip of this nature will be profitable for you because you will doubtless carry back with you information and ideas to incorporate in your hydrating process that will save you many times the expense of such a visit.

First-Aid Training Being Pushed In Many Important Districts

The first-aid training work of the Department of Commerce is proceeding vigorously in a number of important mining, petroleum, and quarrying fields. The outstanding feature of this work at present is the 100 per cent cooperative first-aid training campaigns being conducted for the Department by the Bureau of Mines. The aim of these campaigns is to accomplish the training in first-aid measures of the entire personnel employed by a mining company. Under this system, the first-aid instructors of the Bureau of Mines give the training to a number of key men at a large operation, and in turn they under the direct supervision of the Bureau's instructors, train all other employes. At the conclusion of the instruction, each one must successfully pass an examination conducted by a Bureau of Mines instructor before being given a certificate of proficiency in first-aid measures.

At present, the crews of the following-named mine-rescue cars are conducting 100 per cent cooperative first-aid training campaigns:

Car No. 1 is operating out of Morgantown and Fairmont, in the northern West Virginia and will be engaged in that field for the next several months. Car No. 2 will be engaged in training work in the southern Colorado and northern New Mexico until about July 1. Car No. 3 is working in the Pittsburgh coal district of western Pennsylvania. Car No. 4, with headquarters at West Frankfort, Ill., will be engaged in southern Illinois until about July 1. Car No. 5, will be at or around Kenvir, in southeastern Kentucky for the next two or three months. Car No. 6, with Henryetta, Okla., as a base of operations, is training employes of Oklahoma. Some members of the crew of this car are training employes of oil companies operating in the west Texas fields. Car No. 7 will be at Welch, West Virginia, until April or May while training employes of southern West Virginia. Car No. 9 will be engaged in the training of employes in southern Wyoming until approximately May 1. Car No. 10 has for some weeks been at Whiting, Indiana, and will remain there for the next 60 days giving the first-aid training to employes.

Individual employes of the Bureau of Mines are also conducting 100 per cent cooperative first-aid training campaigns in Washington, eastern Tennessee, western Kentucky and in the Florida rock phosphate mining field.

Under the terms of an arrangement made with the Portland Cement Association, Chicago, Illinois, 83 large Portland cement mills, out of a total membership of 125 mills, have agreed to cooperate with the Bureau in the first-aid training of their employes.

City Building Codes

By J. M. ZANDER*

COMPETITION—that keen inspector of your product and your prices—is growing keener. You must watch your business closer than ever; during the next few years, because competitors are growing desperate.

Building codes are one of the places that you must keep your eye on, for there are interests not above turning the codes of various cities to their definite advantage. It is not the function of a building code to provide specification for buildings or to permit or prohibit one product as against others. Building codes should be as broad as possible and not sacrifice public safety, and should leave specifications to the architects and all codes should be uniform. If codes are too severe unnecessary expense is caused. Considerable reduction in construction costs result from the adoption of uniform Codes in keeping with modern improvements in materials. Differences in Code requirements in different cities and in the manner of wording can cause much inconvenience to architects and engineers, and to owners. Probably the most extensive survey of Codes was made by the Department of Commerce Committee, and their recommended uniform code covers most points a code should cover.

The portion of the Codes that interest us are those applying to brick. There are interests, that by propaganda and otherwise, would have building codes so worded as to prohibit our product. Prohibition is of course absurd and impossible so the effort is put on sniping tactics differing in different localities. Such attempts usually fail from their absurdity and the knowledge of building officials that portions of codes favoring one competitive product are hard to police and harder to enforce and in the end must fail of their purpose.

It is unfortunate that anyone should attempt to secure the specification of any certain materials through a building code.

Public safety, sanitation and fire prevention are the primary reasons for Building Codes and any sections in codes that are not based on these have no place there.

Now this Association was organized to study Sand Lime Brick and seek constant improvement in its quality, but it would seem to be time to add a campaign of publicity to our activities. It will never be necessary for us to put forth the effort in this direction that combinations of makes of shale and low grade surface clay brick have done because we are accepting and working with the recommendations made by such reliable bodies as the A. S. T. M., Building Code Committee of the Department of Commerce and Federal Specifications Board. We must be alert, however, to prevent the using of untruths and data masquerading as engineering facts, and false definitions and specifications purporting to be authorized by the A. S. T. M., when emanating from biased sources.

One of these propaganda efforts is the one that comes up regularly before the A. S. T. M. purporting to be definition of BRICK. This definition would exclude everything unless made from shale, clay or low grade surface material dug from the ground and finally dried, baked or burned, the finished product being somewhat warped, perhaps, like the definition, but more or less the shape of a brick.

The consuming public are too well pleased with Sand Lime Brick to ever accept such a definition, and there is small chance of its adoption anyway. This does not prevent the combination, who make brick from low grade surface clay, from doing battle, by fair means or foul, any place and every place for their pet definition.

Shale, clay and soft mud are not the only earth materials from which man can and does make brick. Mighty good brick are produced by the millions from sand, dug from the earth, and sand is a wonderful fire proofing material.

It is interesting to note that the only official definition of brick made from low materials is the one put out by the Interstate Commerce Commission. This definition removes these brick from the shipping classification of all other brick and gives a lower rate because of their origin. To use the words of the Commission "Common Brick are brick from low grade surface clay." The quality of the brick is not commented on, but brick originating from such low grade surface materials are accorded a rate of 80% of the rate applying on brick.

A Brick is a Brick and should be accepted by all building codes on their merits as determined by careful and unbiased tests. There is nothing better than the standard specifications of the A. S. T. M. which are the result of long and thorough investigation, and for which this Association has always stood. They are intended for incorporation in working agreements for all conditions, and we should, therefore, urge their adoption by all City Building Departments, and incorporation in all City Building Codes.

* Presented at the 25th Annual Meeting of the Sand-Lime Brick Association.

Our course is plain. We must work for uniform Building Codes, as recommended by the Building Code Committee of the Department of Commerce, embodying the specifications for brick as determined by the A. S. T. M. In this endeavor we will be supported by all city, state and national organizations, whose determination is to see fair and uniform codes in force.

You will receive little help from the makers of soft mud and surface clay products as they resent bitterly the preference shown for Sand Lime Brick, and would much prefer special and peculiar code conditions favorable to their product.

Together and individually we must watch code changes, trying in every way to prevent any unfair advantage therein being given to ourselves or others.

New Road Scheme Proposed for Orange Free State, South Africa

A very comprehensive report which, if adopted, will call for a large road betterment and construction program in the Orange Free State, South Africa, has been recently laid before the provincial authorities by the superintendent of roads and local works, according to Assistant Trade Commissioner William L. Kilcoin in Commerce Reports.

The report proposes a primary system to meet the general requirements of the State, made up of main roads, connected to form trunk routes traversing the Province, and a secondary system to form feeder routes to meet local needs.

According to the report, increasing the main roads from 3,816 to 4,788 miles would reduce the proclaimed district road from 7,132 to 5,702 miles, leaving 458 miles less to maintain. In addition, a further reduction of 500 miles could be made, when all the main and district roads were aligned, making a total saving of 1,000 miles over the existing system.

Large Savings Possible

Apart from the large saving of valuable land effected, there would be a saving in maintenance of approximately £10,000 a year. The report recommends that 21 main roads, with a mileage of 591, be proclaimed in 1928-29, and that the remaining 34 new main roads, covering 984 miles, be sifted out in order of importance and brought into service over a period of five years as from April 1, 1929. The various new proposals will first be reported on by their respective road boards and, if necessary, their recommendations can be reviewed by a special road board.

As regards district roads, 143 new routes, covering 2,218 miles, have to be proclaimed, while a decreased total mileage of 1,430 involves yet more de-proclamations. These processes are also to be spread over five years.

Estimated Cost of Plan

It is estimated in round figures that there will be approximately 7,500 miles of main and district roads to be aligned, drained and graded. The cost per mile is placed at £60, or a total of £450,000, plus £50,000 for necessary machinery.

It is urged that this work be carried out as soon as possible, and an expenditure of £100,000 per annum for five years would reasonably meet the case.

The necessity of utilizing the most modern road machinery is emphasized in the report. Between 15 and 20 fully equipped grading units (tractors, graders, rollers, etc., or one for each inspectional area, are recommended.

The full scheme would involve the expenditure of £1,500,000, divided as follows: (1) First-class road construction, £880,000; (2) aligning, grading, and draining main and district roads, £450,000; (3) plant required for (1) and (2), £170,000.

The loan provision for roads and bridges for the current year amounts to approximately £200,000. The estimated requirements for bridges for 1929-30 and the subsequent eight years would be, roughly, £20,000 a year. The amount required to meet the scheme under consideration would average £187,500 per annum, over the 8-year period. If to this is added £20,000 for bridges, the annual expenditure will only amount to £7,500 in excess of the funds provided for the current financial year.

Proposal that Johannesburg Spend £100,000 a Year on Roads

At a recent caucus meeting of the Rate-payers' Party in the Johannesburg city council, it was decided to reject the proposal to raise a loan of £500,000 for the more speedy construction of roads. A number of councillors, however, have put forth a proposal for an additional expenditure of £25,000 to the £75,000 already provided from a penny road rate, so as to bring the amount to be spent annually on roads to about £100,000.

The Transvaal provincial council recently passed the Main Reef Road draft ordinance, which is based on the recommendations of a special commission. Reconstruction, as authorized under the ordinance, will absorb £293,000, £60,000 of which will be spent in the present financial year and £100,000 next year. Interest and redemption will require £39,300, of which £18,000 will be contributed by the municipalities traversed by the road, and the remainder by the Province.

Dutch Specification For Portland Cement

The new Dutch Standard Specifications for Portland Cement, Iron Portland Cement and Blastfurnace Cement contain the following: Definitions: Portland cement is defined as an hydraulic cement containing not less than the following proportions by weight: 1.7 CaO to 1 soluble $SiO_2+Al_2O_3+Fe_2O_3$, made by finely grinding the raw materials into an intimate mixture of correct proportions under constant chemical control until the correct composition is obtained, burning until sintered, and finally grinding together with the requisite admixture, if any, to control the setting time.

Iron Portland cement is an hydraulic cement consisting of at least 70 parts by weight of Portland cement clinker and for the rest of granulated basic blastfurnace slag. The constituents are finely ground together with the admixture, if any, controlling the setting time, under constant chemical control. The slag used must be exclusively blastfurnace slag constituted as follows:

$$\frac{CaO+MgO}{SiO_2+Al_2O_3}=1.$$

Blastfurnace cement is an hydraulic cement consisting of 15-69 parts by weight of Portland cement clinker, and for the rest of granulated, basic blastfurnace slag. The constituents are finely ground together under constant chemical control, together with the admixture, if any, controlling the setting. The slag used must be exclusively blastfurnace slag constituted as follows:

$$\frac{CaO+MgO+1/3\ Al_2O_3}{SiO_2+2/3\ Al_2O_3}=1.$$

The proportion of MgO must not exceed 5 per cent.

For all three cements the proportion of constituents insoluble in hydrochloric acid should not exceed 3 per cent; for Portland cement, the proportion of magnesium and of sulphuric anhydride should not exceed 5 per cent and 2½ per cent respectively. (The percentages refer to weight of cement dried for 90 min. at 100 deg. C.)

The initial set for neat cement is not to take place before 1 hour after mixing. The le Chatelier tests are used for soundness; the maximum permissible expansion is 10 mm.

The residue on a 900-mesh sieve may not exceed 2 per cent for each of the 3 types of cement, and on a 4900-mesh sieve may not exceed 20 per cent for Portland cement and iron Portland cement, and 12 per cent for blastfurnace cement. (These percentages refer to cements dried for 90 min. at 100 deg. C.)

For tensile and compressive strength tests, each type of cement is divided into two classes, i.e., ordinary cement and rapid-hardening cement. The required minimum strengths for cement mortar (1 : 3 by weight) cured for 1 day in damp air and for 2, 6 and 27 days in water, are specified, and are identical for each class of each type of cement. The Bohme apparatus is used in these tests.

Gypsum and Anhydrite Retarders for Portland Cement

The investigation of the fundamental factors involved in the utilization of various forms of calcium sulphate as retarders for Portland cement is being continued by the Department of Commerce in cooperation with Rutgers University, New Brunswick, New Jersey. These tests, which are being conducted at the Non-metallic Minerals Experiment Station of the United States Bureau of Mines, have shown that Plaster of Paris, gypsum, and anhydrite differ greatly in their retarding properties and give different plasticities to the resulting products. They also show that anhydrite can be used alone only under certain peculiar circumstances, although it is satisfactory in mixtures with other calcium sulphates. The results to date have been prepared for publication as a Technical Paper.

One of the important factors shown by this investigation is the degree of fineness to which the cement and the retarder are ground. This has not been thoroughly investigated heretofore. The New Brunswick Station is constructing apparatus for the separation of finely ground cement, gypsum, and anhydrite into fractions of definite particle size, using the air classification method preparatory to studying the time of set of the various fractions of typical Portland cements as compared with the time of set of these same fractions when mixed with various percentages of gypsum or anhydrite of definite particle size.

Magnesite Has Many Uses

Magnesite, a mineral of which many persons probably never heard, has manifold uses and plays a part in the daily life of every one. Magnesite, known to science as carbonate of magnesium, is produced in the United States mainly in California and Washington. The uses to which this mineral has been or may be put are summed up as follows in a report recently published by the Department of Commerce through the Bureau of Mines:

For refractory brick, shapes, crucibles, and furnace hearths, for which both dead-burned magnesite and dead-burned dolomite are used; for medicinal and toilet preparations, which are made from magnesite, dolomite, and natural magnesium sulphate; for pipe covering (mixed with asbestos), which in this country is made from dolomite; for oxychloride (Sorel) cement, which is made from a mixture of caustic calcined magnesite and magnesium chloride; as an absorbent in the manufacture of dynamite, fused magnesia for insulation at exceedingly high temperatures, and an adulterant of paint—all of which presumably call for calcined magnesite, but are relatively unimportant in the consumption of domestic magnesite; in the manufacture of carbon dioxide and the sulphite process of paper manufacturing, in both of which magnesite has been largely displaced by the cheaper dolomite or limestone; and for metallic magnesium, which is made from magnesium chloride.

New Corporations.

Craftsone Corp. of Amer., c/o U. S. Corp. Co., Dover, Del. 100,000 shares com. Silica sand and glass sand.

Ark-Kansas Lime & Stone Co., c/o Robinson, House & Moses, attorneys, Boyle Bldg., Little Rock, Ark. $100,000.

Consolidated Rock Products Co., c/o O'Melveny, Tuller & Myers, attorneys, Title Insurance Bldg., Los Angeles, Calif. 1,000,000 shares com. Merger of 23 separate producing plants and units in Southern California, including Union Rock Co., Consumers Rock & Gravel Co., Inc., and Reliance Rock Co.

Brookville Gravel Co., Brookville, Ohio. 250 shares n.p.v. R. P. Somers, Sam D. Kelly, Robert C. Knee.

Lieb Stone Co., Inc., c/o Corp. Service Co., Wilmington, Del. $200,000.

Marble Crusher Co., 2006 Watson St., Detroit, Mich. $10,000. Marble chips.

Buffalo Stone Co., Mondovi, Wis. 1,000 shares n.p.v.; 150 shares pfd., $100. Pierre O. Southworth, R. M. Rieser.

Gubra Trap Rock Corp., c/o American Guaranty & Trust Co., Wilmington, Del. $1,000,000. To operate trap rock quarries.

Distribution of Cement

The following figures show shipments from Portland cement mills distributed among the States to which cement was shipped during November and December, 1927 and 1928.

Portland cement shipped from mills into States in November and December, 1927 and 1928, in barrels

Shipped to—	November		December	
	1927	1928	1927	1928
Alabama	252,077	192,012	154,744	123,522
Alaska	132	264	132	132
Arizona	52,276	56,742	59,318	42,385
Arkansas	85,638	99,304	57,068	69,131
California	1,027,706	1,025,113	824,570	859,234
Colorado	74,276	52,084	26,601	24,317
Connecticut	170,103	161,388	86,509	97,419
Delaware	20,630	25,357	11,926	14,122
District of Columbia	70,727	88,507	35,714	53,681
Florida	142,655	117,845	113,291	97,857
Georgia	143,624	146,394	82,378	98,912
Hawaii	8,726	22,593	15,380	20,659
Idaho	16,447	17,765	4,441	5,533
Illinois	880,391	930,003	354,542	469,527
Indiana	289,212	258,523	95,766	133,155
Iowa	123,547	96,294	23,951	34,397
Kansas	218,395	167,928	54,211	93,623
Kentucky	114,964	146,416	54,727	63,567
Louisiana	110,968	104,808	87,776	74,396
Maine	30,019	30,175	10,808	11,944
Maryland	180,358	157,297	79,376	90,219
Massachusetts	237,558	224,846	115,909	136,456
Michigan	641,339	728,972	288,329	368,112
Minnesota	96,509	124,063	31,326	52,903
Mississippi	97,083	124,113	54,595	90,745
Missouri	305,254	364,782	122,327	193,691
Montana	14,205	25,857	7,359	11,889
Nebraska	58,307	67,962	22,265	32,472
Nevada	6,789	9,566	7,151	4,029
New Hampshire	34,719	37,083	17,676	19,477
New Jersey	672,737	690,435	334,897	383,075
New Mexico	23,695	21,301	8,557	15,068
New York	1,514,114	1,565,942	972,156	1,150,410
North Carolina	264,393	248,290	112,711	148,245
North Dakota	5,437	14,375	1,503	4,237
Ohio	675,806	707,863	265,267	351,927
Oklahoma	319,776	238,178	166,309	220,102
Oregon	80,653	65,960	51,020	39,466
Pennsylvania	932,367	958,080	482,928	539,402
Porto Rico	0	500	0	0
Rhode Island	58,352	61,403	23,034	43,188
South Carolina	133,046	135,037	76,009	92,059
South Dakota	13,870	17,271	1,570	6,722
Tennessee	174,923	257,552	96,305	138,090
Texas	506,726	447,090	320,201	379,921
Utah	30,046	29,404	13,642	15,132
Vermont	21,938	31,272	12,675	11,026
Virginia	145,820	148,508	76,722	97,175
Washington	129,611	243,351	94,981	132,183
West Virginia	104,307	94,931	42,153	46,917
Wisconsin	214,907	258,637	89,645	114,658
Wyoming	15,407	11,987	7,676	4,428
Unspecified	32,465	32,678	405	502
	11,575,030	11,884,101	6,150,532	7,321,439
Foreign Countries	43,970	66,899	49,468	62,561
Total shipped from cement plants	11,619,000	11,951,000	6,200,000	7,384,000

Production, shipments, and stocks of finished Portland cement, by districts, in January, 1928 and 1929, and stocks in December, 1928. (In thousands of barrels)

District	January						Stocks at end of December, 1928
	Production		Shipments		Stocks at end of month		
	1928	1929	1928	1929	1928	1929	
Eastern Pa., N. J. and Md.	2,351	2,410	1,545	1,387	5,886	6,087	5,065
New York and Maine	549	405	316	257	1,761	1,804	1,656
Ohio, Western Pa. and W. Va.	752	818	453	430	2,903	3,249	2,861
Michigan	379	704	300	266	2,221	2,435	1,998
Wis., Ill., Ind. and Ky.	1,354	946	519	328	3,409	3,307	2,689
Va., Tenn., Ala., Ga., Fla. and La.	1,109	884	938	824	1,851	1,955	1,895
Eastern Mo., Ia., Minn. and S. Dak.	1,107	1,198	276	201	3,527	3,879	2,882
Western Mo., Neb., Kans. and Okla.	476	614	451	349	1,655	1,611	1,345
Texas	463	466	447	459	423	530	522
Colo., Mont. and Utah	176	50	67	61	473	524	535
California	939	1,034	1,111	1,033	616	785	784
Ore. and Wash.	113	252	118	140	391	530	418
	9,768	9,781	6,541	5,735	25,116	26,696	22,650

Production and stocks of clinker, by months, in 1928 and 1929. (In thousands of barrels)

Month	Production		Stock end of month		Month	Production		Stock end of month	
	1928	1929	1928	1929		1928	1929	1928	1929
January	11,839	11,897	9,672	9,627	July	15,981	.....	11,707	.....
February	11,363	.....	12,237	.....	August	16,202	.....	9,357	.....
March	12,501	.....	14,463	.....	September	15,909	.....	7,566	.....
April	13,844	.....	15,002	.....	October	15,782	.....	5,944	.....
May	16,025	.....	4,329	.....	November	14,930	.....	5,953	.....
June	15,940	.....	12,944	.....	December	13,426	.....	7,422	.....

Relation of Production to Capacity

	January		December,	November,	October,
	1929	1928	1928	1928	1928
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
The month	46.5	49.4	60.4	77.4	87.1
The 12 months ended	71.0	74.5	74.0	74.1	73.8

Cement Statistics for January, 1929

The Portland cement industry in January, 1929, produced 9,781,000 barrels, shipped 5,735,000 barrels from the mills, and had in stock at the end of the month 26,696,000 barrels, according to the United States Bureau of Mines, Department of Commerce. The production of Portland cement in January, 1929, showed an increase of 0.1 per cent and shipments a decrease of 12.3 per cent, as compared with January, 1928. Portland cement stocks at the mills were 6.3 per cent higher than a year ago.

The output of another new plant, located in Washington, is included in the statistics here presented which are compiled from reports for January from all manufacturing plants except four for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 160 plants at the close of January, 1929, and of 155 plants at the close of January, 1928. In addition to the capacity of the new plants which began operating during the twelve months ended January 31, 1929, the estimates include increased capacity due to extensions and improvements at old plants during the period.

Recent Patents

The following patents of interest to readers of PIT AND QUARRY recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,698,748. Power-shovel structure. Emery J. Wilson, Cleveland, Ohio, assignor to Thew Shovel Co., Lorain, Ohio.

1,698,758. Pulverizer. Paul S. Knittel, Jersey City, N. J.

1,698,838. Attrition mill. James G. Bryant, Port Huron, Mich.

1,699,180. Apparatus for removing dust from stone crushing and segregating apparatus. Frank J. Colgan, Columbus, Ohio.

1,699,230. Concrete-mixer. Charles M. Eberling, Cleveland, Ohio.

1,699,371. Tripping device for the bucket-door or power shovels. Holger L. Mitchell, Milwaukee, Wis., assignor to Harnischfeger Corporation, same place.

1,699,451. Process of manufacturing cement. Thomas Rigby, London, England.

1,699,522. Method and apparatus for grading material. Damon G. Dunkin, Guion, Ark.

1,699,535. Mine-car. Warren V. Johnson and Robert C. Kepner, Bloomsburg, Pa., assignors to American Car & Foundry Co., New York, N. Y.

1,699,718. Revolving grizzly. Thomas Robins, New York, N. Y., assignor to Robins Conveying Belt Co., Passaic, N. J.

1,700,032. Production of Portland cement. Harvet R. Durbin, Larchmont, N. Y., assignor to International Cement Corporation, New York, N. Y.

1,700,181. Interchangeable shovel crane. Leslie A. Russell, Milwaukee, Wis., assignor to Koehring Co., same place.

1,700,468. Dipper-tripping device. Charles E. Clutter and Louis R. Russell, Marion, Ohio, assignors to Marion Steam Shovel Co., same place.

1,700,868. Vibrating screen. Herbert S. Woodward, Carbondale, Pa.

1,701,006. Steering mechanism for crawling traction devices. Benjamin Jacoby, Dwight J. Shelton, Berlin S. Ferguson, and Francis Jennings, Marion, Ohio, assignors to Marion Steam Shovel Co., same place.

1,701,013. Carriage for excavator-buckets. George T. Ronk, Cedar Rapids, Iowa, assignor to Speeder Machinery Corporation, same place.

1,701,016. Steering mechanism for power shovels. Dwight J. Shelton, Marion, Ohio, assignor to Marion Steam Shovel Co., same place.

1,701,280. Agitating drag. Clarence Sorensen, Brooklyn, N. Y.

1,701,594. Steering mechanism for power shovels of the traction-belt type. Dwight J. Shelton and Charles A. Weber, Marion, Ohio, assignors to Marion Steam Shovel Co., same place.

1,702,224. Rotary discharge-chute. George E. Webb, Milwaukee, Wis., assignor to Koehring Co., same place.

Statistics of Cement

The ratio of the operations to the capacity of the American portland cement industry during the month of January was 46.5 per cent, according to figures released by the Bureau of Mines of the Department of Commerce. During the month 9,781,000 barrels were produced, 5,735,000 barrels were shipped, and there were in stocks on hand at the end of the month 26,696,000 barrels. Production in January, 1929, was 0.1 per cent more and shipments 12.3 per cent less than in January, 1928. Stocks at the mills were 6.3 per cent higher than a year ago.

Exports and Imports

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

Exports of hydraulic cement by countries in December, 1928

Exported to—	Barrels	Value
Canada	2,811	$12,653
Central America	10,485	25,320
Cuba	5,713	21,565
Other West Indies and Bermuda	7,950	23,056
Mexico	6,151	18,614
South America	20,874	93,641
Other countries	9,136	55,355
	63,120	250,204

Imports of hydraulic cement by countries, and by districts, in December, 1928

Imported from—	District into which imported	Barrels	Value
Belgium	Galveston	9,251	$11,630
	Massachusetts	27,063	35,281
	New Orleans	6,973	8,258
	New York	2,497	2,699
	Philadelphia	29,459	42,254
	Porto Rico	505	1,010
	South Carolina	15,000	18,108
	Total	90,748	119,270
Denmark	New York	9,047	9,500
	Porto Rico	46,700	64,466
	Total	55,747	73,966
France	Los Angeles	492	1,011
	New York	2	15
	Total	494	1,026
Germany	Los Angeles	1,000	2,443
Norway	Porto Rico	75	76
	San Francisco	24,183	30,393
	Total	24,258	30,469
United Kingdom	New York	3,735	6,109
	Philadelphia	10	17
	Total	3,745	6,126
	Grand total	175,992	233,300

Exports and imports of hydraulic cement, by months, in 1927 and 1928

Month	Exports				Imports			
	1927		1928		1927		1928	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	75,346	$254,072	56,400	$204,875	193,175	$269,661	234,753	$342,797
February	71,404	233,985	62,828	221,620	130,421	200,680	164,408	217,525
March	67,956	240,165	74,983	265,719	181,145	261,519	235,930	330,074
April	72,383	243,832	61,676	205,882	192,318	313,262	249,458	324,371
May	59,332	205,574	70,173	236,005	178,929	263,618	190,509	256,872
June	69,205	237,281	59,536	201,313	129,111	201,682	266,537	359,637
July	72,337	249,737	83,759	291,055	175,042	249,665	112,887	151,877
August	61,371	209,198	88,736	302,866	117,605	170,167	259,988	358,858
September	57,890	207,817	71,995	252,843	233,066	304,796	173,439	226,295
October	67,639	230,668	62,137	246,010	221,274	321,777	152,210	226,909
November	79,764	257,428	69,313	260,310	141,485	190,419	67,240	92,468
December	62,099	226,960	63,120	250,204	156,609	209,205	175,992	233,300
	816,726	2,796,717	824,656	2,938,702	2,050,180	2,956,451	2,283,351	3,120,983

Domestic hydraulic cement shipped to Alaska, Hawaii, and Porto Rico, in December, 1928

	Barrels	Value
Alaska	336	$1,014
Hawaii	21,616	46,978
Porto Rico	4,750	11,525
	26,702	59,517

Production and stocks of clinker (unground cement), by districts, in January, 1928 and 1929. (In thousands of barrels)

District	Production		Stocks at end of month	
	1928	1929	1928	1929
Eastern Pa., N. J. and Md	2,727	2,824	1,241	1,344
New York and Maine	744	585	603	1,080
Ohio, Western Pa. and W. Va	1,062	1,121	1,417	1,205
Michigan	773	913	1,157	876
Wis., Ill., Ind. and Ky	1,671	1,499	835	984
Va., Tenn., Ala., Ga., Fla. and La	1,247	1,076	910	995
Eastern Mo., Ia., Minn. and S. Dak	1,224	1,279	603	570
Western Mo., Neb., Kan. and Okla	629	715	396	511
Texas	418	456	141	145
Colo., Mont. and Utah	161	101	356	395
California	989	1,053	1,544	1,219
Ore. and Wash	194	275	469	303
	11,839	11,897	9,672	9,627

Flotation of Low-Grade Bauxites of Southeastern States

Preliminary tests made on the low-grade, high-silica bauxites of the southeastern states, by the Department of Commerce at the Southern Experiment Station of the United States Bureau of Mines, in cooperation with the University of Alabama, Tuscaloosa, Alabama, have demonstrated that certain classes of these ores may be treated by the flotation process with fair results. In some of the ores the impurities were of such minute dissemination that physical processes of separation were impossible.

In the United States there are two districts that produce bauxite—the Arkansas district and the Alabama-Georgia - Tennessee - Mississippi district. The deposits in Mississippi have been discovered recently and are not as yet productive, but it seems reasonable to consider them as a part of the district that includes the deposits of Alabama, Georgia, and Tennessee. The two districts are often referred to as the Arkansas field and the Appalachian field. The Arkansas field has been by far the largest producer, and at present over 90 per cent of the bauxite production of the United States comes from the Arkansas field. The bauxite industry in the Appalachian field had its beginning in 1889, and since that time the total production of the states of Alabama, Georgia, and Tennessee has been nearly a million tons. The production of bauxite in this field has languished in the last five or six years, and in 1927 its production was only about 14,000 tons. The recent decrease in production is due mainly to the fact that many of the known deposits of commercial-grade ore have become exhausted. There are, however, considerable quantities of low-grade bauxite in the Appalachian field, but these have not been available because there has been no satisfactory way of concentrating low-grade bauxite. The quantity of low-grade material in the Appalachian field is probably fully as large as the tonnage of commercial ore which the field has already produced.

In the Bureau of Mines investigations, sodium sulphide and oleic acid were used as flotation reagents. Other reagents, such as kerosene or machine oil, facilitated the process. The economic value of the process will depend on whether it can be used on a commercial scale. The large initial investment required in building a flotation plant is usually not justified unless the reserves of ore are large, and in the Southeastern States the bauxite deposits are usually so pocketty that very large ore reserves are hardly ever found on any individual property.

There are some considerations in connection with the possibilities of the process which should not be overlooked. Many of the ores which are too high in silica to be marketable are very close to the border line as defined by specifications of the consumers so that the removal of a comparatively small amount of silica would leave a commercial product. Flotation concentrates would probably have the advantage of being merchantable as "pulverized" bauxite. According to current quotations, bauxite of chemical grade commands a price of $7.50 to $8 per long ton, f. o. b. Georgia mines. This same grade is quoted at $14 per long ton when pulverized and dried. It is believed that flotation concentrates would, under ordinary circumstances, be fine enough to meet the specifications for pulverized bauxite, and the flotation of high-silica bauxite should have certain possibilities of commercial application as a process for obtaining pulverized bauxite of chemical grade from low-grade ores.

Further details of this investigation are given in Serial 2906, "Preliminary Examination of Low-Grade Bauxite with Particular Reference to Flotation," by B. W. Gandrud and F. D. DeVaney, copies of which may be obtained from the United States Bureau of Mines, Department of Commerce, Washington, D. C. The final report on the investigation is now being prepared for publication as a Bureau of Mines Bulletin.

The Highway System of Rumania

With an insufficient network of railways to meet the needs of Great Rumania, and a water transportation system of restricted importance, the Rumanian highways are coming to occupy a role of major importance in the national economy of the country, according to a report of Consul J. Rives Childs in Special Circular No. 1083.

Two factors have complicated the solution of the highway problem of Rumania since the war: First, the new situation created by the development of motor transportation which, on the one hand, has meant new tasks for the highways and, on the other hand, has greatly contributed to their deterioration; and, secondly, the depleted financial sources of both private individuals and of public bodies—State, District and Communal—which have retarded not only the solution but even the relief of the highway problem.

As a result of the war and the acquisition of the new provinces of Transylvania, the Banat, Bukowina, and Bessarabia, both the area and population of Rumania have doubled; the area now comprising some 113,887 square miles, and the population totaling approximately 17,000,000, of which no less than 80 per cent are peasants, mostly of extremely simple habits and frugal tastes.

Use of Contractors in Road Building

While the maintenance and construction of the Rumanian national roads are undertaken for the most part directly by the Ministry of Public Works, occasionally tenders are asked of contractors. Thence local contractors are accustomed, however, to employ only the simplest equipment, and where more important works are undertaken by them, necessitating the use of shovels, draglines and tractors, the required machinery is either borrowed from the Ministry or from foreign contractors.

Construction of Municipal Streets

Even in the construction and upkeep of streets in the principal cities of Rumania, the work is accomplished by the simplest means at the disposal of the municipalities or contractors concerned.

The more important streets of the principal towns and cities are paved with asphalt or granite blocks, which are seldom applied on a concrete base, and constant repair is accordingly necessary. In Bucharest, the capital and commercial center of the country, with a population of some 800,000, modern types of road making machinery are practically unknown.

Conclusion

The highway problems facing Rumania may be summarized as follows:

(1) Repair of the highways which have deteriorated during the War and since the War as a result of the neglect of their upkeep;

(2) Reorganization of the maintenance of the road system, at present in a state of disorganization; and

(3) Construction of new highways of compelling economic importance for new Rumania.

The solution of these tasks, however, is conditioned incidentally upon the reorganization of the stone quarries and of the railways which would permit an adequate supply and transportation of material—problems which constitute the periphery of a vicious circle which revolves around the problem of the finding of adequate financial resources, a stumbling block in the way of solution of every economic problem confronting the country.

PIT AND QUARRY FOREIGN DIGEST

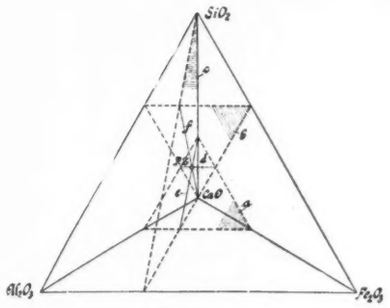


Figure I

The Moduli of Portland Cement

So long as the constitution of Portland cement remains unsolved, the various moduli in practical use will remain of service. These moduli may be graphically represented by tetrahedra, each corner of which represents 100 per cent SiO_2, CaO, Al_2O_3, and Fe_2O_3. In Figure I, the hydraulic factors occupy a horizontal plane in which the CaO corner lies. The three moduli used in the cement industry are shown by three plane surfaces. (Planes a, b, and c.) The traces of the silicate and iron moduli (d and e) as well as the intersection of the silicate and iron moduli (f), so that the composition of the cement corresponding to any desired modulus may be easily and quickly read. As an example of such a graphic determination, Figure II may be used. It is evident that if all three moduli (iron, silicate and hydraulic) are constant, the result is a point inside the tetrahedron, the intersection of the three modulus planes. If two moduli are constant, the result is a straight line, the intersection of two planes, and any point on this line will give the desired result. With only one modulus constant the plane passing through the tetrahedron at this point will be the locus of all points determining the desired composition. For example, if R_2O_3 is constant, and all three moduli add up to 2.00 (a necessary condition) then all possible corresponding cements must have constitutions between the limits:

	I	II
CaO	88.88%	0.00%
SiO_2	0.00	88.88
R_2O_3	11.11	11.11

If in addition the iron modulus is assumed constant, then in figure II, then all possible cements of corresponding constitution lie on the line 1-2. If the value of the silicate modulus is known, the hydraulic modulus is automatically determined and the intersection of the planes of these moduli, line 3-4, gives the constitution of the desired cement at the intersection of the two lines, 1-2 and 3-4.—Hess. (Cement, Jan. 10, 1929.)

Strengths of Mortar Cement and Concrete

The addition of concrete aggregate to cement-sand mixtures is generally supposed invariably to increase the 28 day strength of the resulting product. The question was carefully investigated using graduated combinations of cement, sand and gravel. Two complete sets of tests were run using in one, only the amount of water necessary for setting, the water-cement ratio varying from 0.23 to 0.42; and making the other set of mixes "soft," the water-cement ratio varying from 0.31 to 0.75, depending upon the amount of coarse aggregate present. In the first set of experiments, it was found that the addition of one part of gravel to the mortar (cement and sand) caused a slight increase of strength, the resulting concrete showing a slightly greater 28 day strength than the mortar. But with only one exception the addition of more than one part of gravel to any of the cement-sand mixes was followed by a decrease in strength over that of the mortar. The addition of gravel to the "soft" mortars was followed in every case by a decrease in strength, no maximum appearing, as in the case of the merely damp mixes. In general, therefore, a small addition of coarse aggregate to damp mixes raises the compressive strength of the resulting concrete, further additions decrease this strength. In the case of wet mixes, any addition of coarse aggregate results in a lessened tensile strength.—H. Burchartz. (Zement, Jan. 3, 1929.)

Cellular Cement

Cement pulp and a froth-flotation agent are fed together with air into the annular space between an outer tank and an inner concentric vessel, and the mixture is agitated by the rotation in the annular space of a single perforated cage fitted with vanes, or by two such cages rotating in opposite directions to overcome centrifugal action. Alternatively, the inner shell is rotatable and carries perforated plates alternating with those on a cage rotating in the opposite direction.—G. B. Hinton (British Patent 298,847). B. C. A.

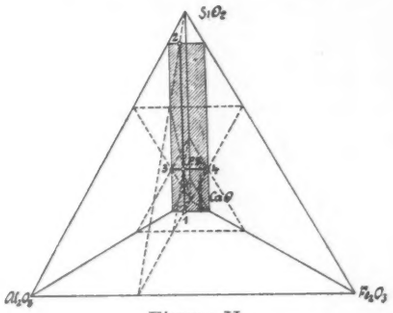


Figure II

Spumous Mass of Cementitious Material

(a) A mixture of cement, water, and a froth-flotation agent, with or without the addition of sand, etc., is stirred in a tank provided at the bottom with an air inlet, the stirring apparatus comprising alternating perforated plates rotating in opposite directions. (b) Cement mixtures aerated as above to contain relatively large cells are mixed with mixtures containing smaller cells to form a product containing large cells surrounded with adherent smaller cells.—G. B. Hinton (British Patent 300,842). B. C. A.

The Shrinkage of Cements

Specimens were stored at constant temperatures and practcially constant humidity for one year, after which very little change occurred. The shrinkage varied with the cement, with the amount of mixing water, with the amount and nature of the aggregate and with the amount of admixtures. Angular aggregates are preferred. $CaCl_2$ Na_2CO_3 and water glass increased the shrinkage. The concrete should be applied as dry as possible and after it has set it should be kept wet for a while.

Asphalt Concrete

A bituminous emulsion (which may be formed of asphalt, resin, NaOH and water) to which protein material may be added is mixed with coarse stone separately and fine stone or the like is then added with or without previous admixture with emulsion. Naamlooze Vennootschap, etc. (British Patent 286,552). C. A.

Artificial Stone, Bricks, Briquets, Etc.

In making bricks, fuel briquets, etc., lime is used as a binder with gravel, sand, coal or other materials and is treated with CO_2 during slaking and the material or molded product is subjected to steam heat. A. R. Davies, et al. (British Patent 286,334). C. A.

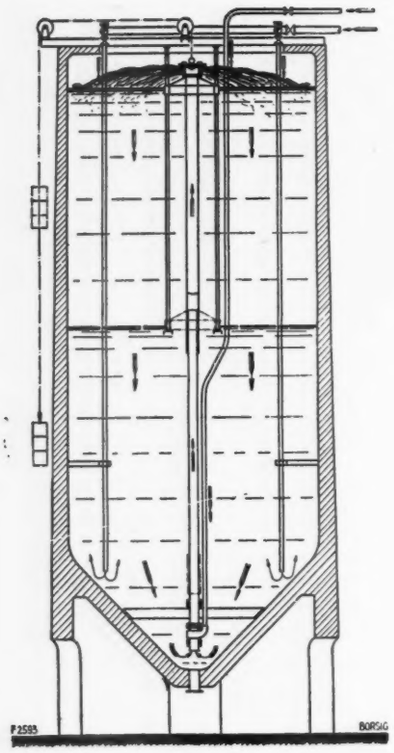


Figure III

Mixing Raw Cement Slip By Air Pressure

Air pressure is finding general use today (Germany) in mixing raw slip, as it results in more efficient agitation with a uniform composition of the slip entering the kiln. The oldest method of using air pressure is shown in Figure III. The air is introduced at the bottom of the container at several different points. The air pressure automatically increases with the height of the liquid slip. This type is found to give much more uniform slip than mechanical mixers. The pressure builds up on top of the slip, forcing it up through the central pipe to the upper part of the container, insuring a complete agitation. Figure IV shows an apparatus in which the slip is lifted over the upper edge of the inner container by air pressure, falls to the bottom again and is circulated once more. Figure V shows a plant layout of mixing tanks and correction tanks in which the water content is adjusted. The resultant product is chemically and mechanically uniform. Thickened raw slip is found in the lower part of the correction tank and is thrown upon the surface, where it meets the incoming stream of thinner slip, projected by the Mammut pump. Figure VI shows the Dryckerhoff-Borsig system of mixing tank. It is obvious that a mixer of this design will give a more vigorous agitation than the usual type.—Steen (Zement, Jan. 17, 1929).

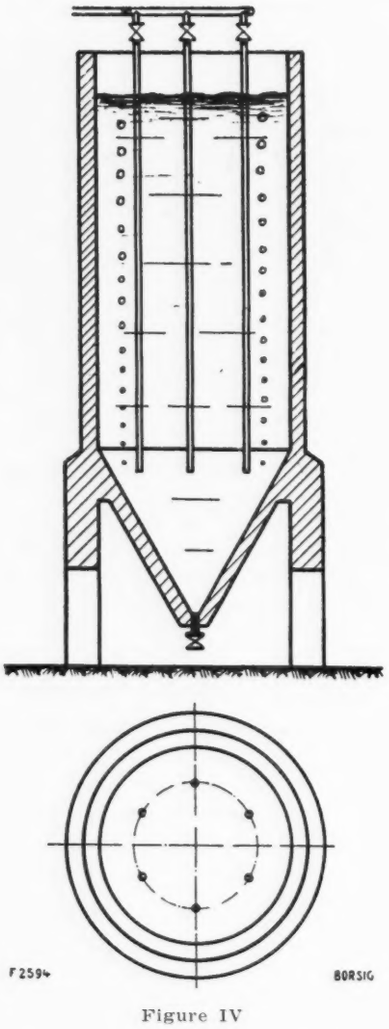


Figure IV

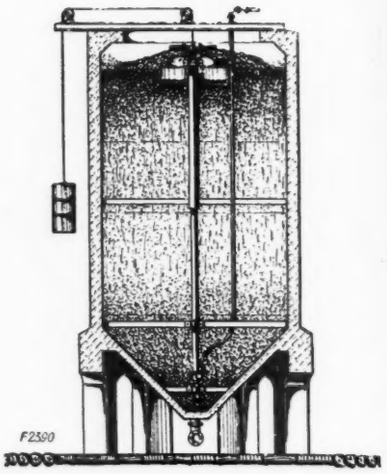


Figure VI

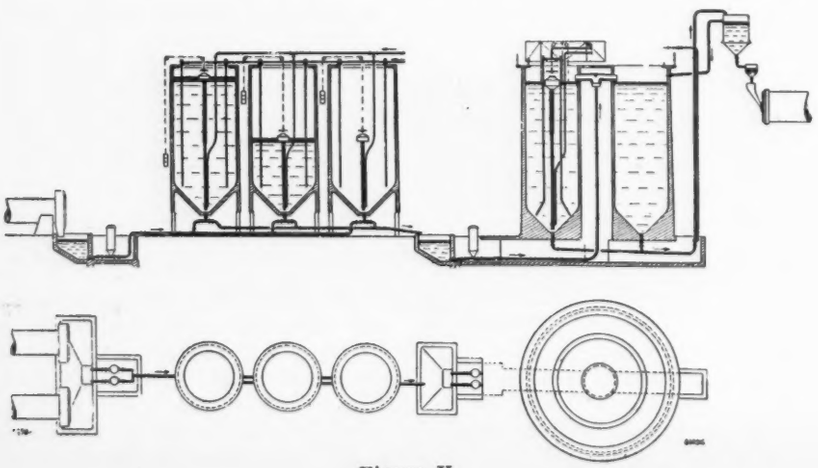


Figure V

The Manufacture of Supercement

A cement of the composition: 20.5-0.7% SiO_2, 3.0-0.6% Al_2O_3, 8.0-0.5% Fe_2O_3 and 66-7% CaO has given two-day strengths greater than 380 and 36 kg./sq. cm. The logical way to build waste-heat boilers is along an extension of the axis of the rotary kiln, allowing the attainment of much higher steam pressures.

N. C. Kybiacou. Rev. materiaux construction trav. publics. p. 341-5. 1928. C. A.

Material Resembling Marble

A material resembling marble is obtained by drying stone such as gypsum or alabaster in a furnace, plunging it successively into a bath of alum, a bath of K_2SO_3 and a coloring bath. The product is dried and polished.

Vincent Molinari. (French Patent 636,140). C. A.

Burning Lime or Cement

The pulverized raw material is granulated without the addition of fuel, and the granules are sintered to clinker in a rotary kiln after preliminary heating by waste gases from the kiln. Granulation is effected in a rotary drum to which water is supplied by a perforated pipe. With limestone, this drum is unnecessary. —O. Lellep (British Patent 288, 192.)

INTIMATE NEWS OF MEN AND PLANTS

Elkhart Company Acquires Moraine Gravel Company

The Elkhart Sand and Gravel Company of Elkhart Lake, Wisconsin, has purchased the Moraine Gravel Company of Plymouth, Wisconsin, and plant at Glenbeulah.

This consolidation increases the facilities and production capacity of the Elkhart Sand and Gravel Company and places it as one of the largest producers of sand, gravel and stone in the state of Wisconsin. The company is equipped now to make shipments of its product over the lines of the Chicago and Northwestern and the Chicago, Milwaukee and St. Paul railways.

The Elkhart Company now owns and controls more than 1,000 acres of valuable gravel deposits in the state.

The executive and sales officers of the Elkhart Sand and Gravel Company will be maintained in Elkhart Lake, Wisconsin.

Notable Consolidation of Feldspar Producers

The Consolidated Feldspar Corporation, capitalized at $5,000,000 and assets of $8,000,000 chartered under the laws of Delaware, has been created to take over the operations of the Maine Feldspar Company, Auburn, Topsham and Brunswick, Me., the Dominion Feldspar Corporation, Rochester, N. Y., and the feldspar division of the Isco-Bantz Company, Murphysboro, Illinois, with properties near Keystone, S. D.

The consolidated company will operate a group consisting of 16 mining properties and mills located in twelve different states and Canada.

The company contemplates an expansion and improvement program which includes a new feldspar milling plant in the vicinity of Keystone, S. D., and the removal of the present Murphysboro mill to that point.

Herbert P. Margerum, head of the Golding Sons Company and the Erwin Feldspar Company, Inc., is president of the new company, Norman G. Smith, vice-president, R. W. Lawson, vice-president, and M. A. Murray, secretary-treasurer.

The opinion of those interested is that this combination will do much to strengthen the feldspar industry.

The company will control the production of approximately 100,000 tons of feldspar or about one-third of the production of the United States.

Cushing Stone Company Acquires New Property

The Cushing Stone Company of Schenectady, N. Y., has purchased the crushed stone plant and a limestone area of 160 acres from Neil F. Ryan of that city.

The Cushing Stone Company and its subsidiaries, the Schoharic Stone Corporation and the Scotia Stone and Gravel Company, own five pits and quarries in Amsterdam, Cranesville, Schoharic and Scotia.

The combination of these companies makes the Cushing Stone Company the largest operator in that section of the state and will result in economical distribution of crushed stone or gravel to meet the demands for this class of material.

Superior Portland Elects President and Directors

This issue of PIT AND QUARRY features Edwin P. Lucas on its Men of the Industry page. This is because Mr. Lucas is one of the men of the Cement Industry who saw opportunity and worked his way to one of the highest positions within its bounds, President of the Superior Portland Cement Company of Seattle, to succeed his friend and benefactor the late John C. Eden.

Twenty-two years ago Mr. Lucas went to the Pacific Northwest from Texas at the invitation of Mr. Eden. He was on the ground when the Superior Portland Cement Plant was started at Concrete and for more than ten years worked in virtually all phases of the activity of that plant. In the Bellington Mines, he began as a miner and worked his way to the management of the properties. As vice-president of the Cement Company, he accepted much of the responsibility for the management of the interests of Mr. Eden and particularly the affairs of the Superior Portland Cement Company.

Officers reelected at the meeting were: C. N. Reitze, vice president and general manager; Mr. Dickinson, secretary, and Mr. Tongue, treasurer. Directors in addition to the officer-members and Mr. Reid, include: M. A. Arnold, president of the First National Bank and First National Corporation; R. V. Ankeny, vice president of the Seattle National Bank; J. A. Swalwell, chairman of the Dexter Horton National Bank; C. L. Wagner, general superintendent of the plant at Concrete; Herman Goetz, president Northwest Steel Rolling Mills; John J. Murphy, former sales manager of the Superior Portland Cement Company and of the Carnation Milk Products Company; James H. Kane, attorney, director Dexter Horton National Bank; Nion R. Tucker, president of Bond and Goodwin and Tucker, Inc., vice president of The San Francisco Chronicle and director of many outstanding Pacific Coast industries; Thomas B. Eastland, vice president Bond and Goodwin and Tucker and director Transcontinental Air Transport, Western Dairy Products Company and other western institutions.

Gravel Company Installs New Pumping System

The Arkansas Sand and Gravel Company of Pine Bluff, Ark., will soon be ready to operate the new plant located on the Arkansas River.

All equipment has been delivered and the construction of the pontoons is nearing completion.

The plant is designed to handle approximately 1,000 yards of washed sand and gravel per day, from the pump, through a ten inch pipe line 800 feet long. The screening plant will have a large capacity and storage bins will be arranged for convenient handling of the finished material into cars or trucks.

This installation of the Arkansas Sand and Gravel Company marks the first one of its kind on the Arkansas River in the state.

New Gravel Company At Muskogee, Oklahoma

The Vickery Gravel Company, recently incorporated by A. F. House of Tulsa, J. T. Lantrey and E. F. Vickery of Muskogee, will establish their headquarters at Muskogee.

Operations will be started in the early spring on a tract of land near the Riverbank power plant in the Arkansas River bottoms.

Sand Company to Erect New Office Building

Construction work on the erection of a new office building for the Cape Sand Company of Cape Girardeau, Mo., has been started by the contractor. The new building fronting on Main Street will be of red face brick.

Storm Sinks Sand And Gravel Steamer

The steamer "Marie J.," owned by the Henderson Sand and Gravel Company of Henderson, Ky., was sunk in the Ohio River at Mound City, Ill.

The boat was anchored undergoing repairs when a severe storm tore it from its mooring on shore, driving it to the middle of the river, where it sank. It is reported that no attempt will be made to recover it on account of the depth of the water. The loss is estimated at $12,000.

Dolomite Products Company To Build New Crusher

John H. Odenbach, president of the Dolomite Products Company, announced that this company will erect a new crushing plant, to cost $450,000, in Penfield, N. Y. A tract of land consisting of 150 acres has been purchased to add to the output of the present plant.

Solvay Process Company Acquires New Quarry

It is reported that the Solvay Process Company of Syracuse, N. Y., a subsidiary of the Allied Chemist and Dye Corporation, has increased its quarry holdings along the Lake Ontario shore district by the purchase of the Adams-Buffer Company of Chaumont, N. Y. The holdings of the purchased company include 119 acres of limestone property.

New Stone Crushing Plant To Operate at Portland

W. P. Smith and Sons, of the Wabash Stone Company, have purchased limestone property southwest of Portland, Ind., for quarry purposes.

Plans are being made to start excavation as soon as possible. Modern equipment and machinery for the manufacture of crushed stone for road construction and agricultural limestone will be installed at an early date.

Newpoint Stone Company Buys Brown Quarries

Theodore Wanstrath of Batesville and James B. Wirt of Newpoint, Ind., owners of the Newpoint Stone Company, have purchased the Brown Quarries at Greensburg, Ind., from the owner, Carl E. Brown. Mr. Wanstrath and Mr. Wirt live in Decatur and are well known contractors and builders. The quarry has a large capacity and a good season's run is contemplated.

Cement Ship to Sail On First Trip of Season

The freighter "Diamond Cement," Captain J. E. Guptill in command, of the Pacific Coast Steamship Company, sailed from Seattle, Ore., February 26, in her first trip of the season, bound for the lime rock quarries on Dahl Island, Southeastern Alaska. The Pacific Coast Steamship Company is a subsidiary of the Pacific Coast Cement Company.

Granite Company Sustains Fire Loss of $30,000

Fire destroyed the crusher plant of the Raleigh Granite Company's Greystone Quarries, located four miles north of the city of Henderson, N. C., Monday night, February 4. The origin of the fire is unknown, but it is supposed it started from a defective switch. The wood frame work of the structure and all machinery in the crusher plant were destroyed. The damage is estimated at $30,000.

Penglase Goes to Evansville

G. H. Penglase, who has been manager of the Penglase Sand and Gravel Company at Grayville, Ind., for eight years, will leave to go to Evansville. It is announced that the sand and gravel business will be continued under new management.

Sand and Gravel Elects Officers and Directors

At a recent meeting of the stockholders of the Lenawee Sand and Gravel Company at Tecumseh, Mich., S. J. Wilson, Fred Blouch, Dr. J. W. Nixon, Charles Thurlby and Ira Ashley were named as directors.

The officers elected were: President, Mr. Wilson; Vice-President, Mr. Blouch; Secretary-Treasurer, Mr. Ashley. Charles Thurlby, superintendent, reported the prospects for 1929 were most encouraging.

New Virginia Plant Begins Operations

Operation of the first unit of the Clinchfield Sand and Feldspar Corporations plant at Brookneal, Virginia, was started recently.

The additional units will be completed and operation of the entire plant commenced as soon as the necessary machinery is received and placed in position.

G. M. Stengel, president, Joseph P. Rodgers, secretary, Henry M. Hannah, sales executive, and J. A. Merritt of the board of directors were present to witness the starting of the new plant.

New Feldspar Mill

The United States Feldspar Corporation has recently completed a new mill on tract of land comprising about 3500 acres near Cranberry Creek, New York.

The main quarry operations located two miles from the mill site, are connected by an aerial tramway.

The new mill has a capacity of five tons an hour. Arrangements have been made for the installation of a second similar unit in the near future.

Gar-Rock Asphalt Company Has a New Quarry Manager

Quarry operations of the Gar-Rock Asphalt Company of Louisville, Kentucky, have been placed under the management of G. E. Benjamin. This company succeeds the Garfield Rock Asphalt Company in operating quarries and mills at Garfield, Kentucky. This rock, as it occurs naturally, is sandstone impregnated with 7.5 per cent of bitumen, a material that is coming into extensive use for road-building. The Garfield quarry is in shape to produce a supply to the present mill for the next three years.

Millstone Production Not What It Used to Be

American millstones have been and are still for the most part made of quartz sandstone and conglomerate, chiefly in Ulster County, New York, and Montgomery County, Virginia, but also in Pennsylvania, according to a report recently issued by the Department of Commerce, through the United States Bureau of Mines. Millstones are also made of granite, particularly in Alabama, Maine, Minnesota, New Hampshire and North Carolina. Formerly the millstone manufacturing industry was much larger than at present. About 1880 the total value of the stones produced and sold in the United States was around $200,000 annually. The production has declined since the late eighties and during the last seven years has been less than $50,000 worth of stones annually. The decline is due in part to the fact that the manufacture of millstones is a handcraft in which, as in many others in the United States, the old master craftsmen, who are gradually disappearing, are not being replaced. In part, also, the change is due to new processes in the grain, paint, and mineral milling industries in which the old-style burrstones and chaser mills are being supplanted by grinding equipment of an entirely different type.

NEWS OF EQUIPMENT MANUFACTURERS

Sterling Hoists

The Sterling Machinery Corporation in a 48 page Bulletin A, feature the Sterling Hoist. Complete specifications and features of construction precede detailed descriptions of Type A—single and double friction drum hoists, 35 to 7½ h.p. gasoline engine and electric motor driven, with a variety of load capacities and line speeds.

Sterling Hoists are equipped with Timken bearings and have Johns-Manville asbestos frictions. They are powered with Continental Motors or General Electric, Westinghouse or Fairbanks-Morse, electric motors.

Harbison-Walker Appoint Research Director

J. Spotts McDowell has been appointed Director of Research of the Harbison-Walker Refractories Company. The scope of the company's research work will be broadened at the central laboratory in Pittsburgh, while in general, control work to insure uniformity of product, will to a large extent be handled in the smaller laboratories at the individual plants.

Mr. McDowell, who has been connected with the Harbison-Walker Refractories Company for some twenty years, is well known to the refractories and allied industries through his contributions to technical literature and his activities in the American Ceramic Society, the American Society For Testing Materials, the American Refractories Institute and other societies of which he is a member. He is a graduate of the Massachusetts Institute of Technology in Mining Engineering.

Brand Appointed Director of Milwaukee Company

W. H. Brand, Vice President of the First Wisconsin Trust Company, has been elected a Director of the Interstate Drop Forge Company, at the annual meeting of the Directors of the Company.

The Directors re-elected are, Edgar L. Wood, W. C. Frye, C. R. Messinger, W. J. Nugent, Clifford F. Messinger, L. S. Peregoy and C. E. Stone.

The Interstate Drop Forge Company specializes in the manufacture of drop forgings only and are a big source of supply for the automotive and agricultural industries. The plant is located at 27th Street and Capital Drive, Milwaukee, Wisconsin. Recent additions to the present building and installation of new machinery has increased its capacity 40 per cent.

The Interstate Drop Forge Company is part of an affiliated group consisting of the Chain Belt Company, The Federal Malleable Company, The Siryer Steel Casting Company, all of Milwaukee.

The officers of the company are, C. E. Stone, president; Lemar S. Peregoy, vice president, and C. C. Bremer, secretary and treasurer.

Engineering Firm Opens Factory Branch

The Smith Engineering Works has established a factory branch in Portland, Oregon, at 700 East Davis Street, with S. A. MacIntosh in charge.

It will conduct the distribution of Telsmith crushers, reduction crushers and primary breakers. A complete stock of authorized factory repair parts and new crushers will be carried.

Mr. MacIntosh will maintain supervision of service and repairs of Telsmith crushers now in operation in this territory as well as the distribution of new ones. The service inaugurated will be appreciated by owners of these crushers.

Foote Brothers Corrects Former Announcement

Foote Brothers Gear and Machine Company recently announced that the new Eastern Branch Office would be located in the Woolworth Building, New York City. This is not correct, as the Eastern office is located in the Transportation Building, 225 Broadway, New York City.

It is suggested by the Company that customers and prospects in the Eastern territory direct their communications to the Eastern Sales Manager, E. A. Phillips.

Crago Joins Foote Brothers

R. F. Crego, formerly Sales Manager of the L. C. Smith Bearing Company of Chicago has recently joined the Sales Organization of Foote Brothers Gear and Machine Company.

He will handle customers located in the loop territory of Chicago.

Opens New Branch Office

The Barber-Greene Company, manufacturers of ditchers, loaders, conveyors and coal handling equipment, has opened a new branch office at Cedar Rapids, Iowa.

The office is under the supervision of Jack Marson, who has been connected with the company for a number of years and is well known to the trade. Mr. Marson has opened a branch office in Omaha with W. E. Toole in charge.

Prest-O-Lite Expands

The Prest-O-Lite Company, Inc., acquired the business of the Acetylene Products Company, which operated two acetylene producing plants at 401 E. Buchanan Street, Phoenix, Arizona, and at 914 Texas Street, El Paso, Texas. These plants are now being operated as units of the Prest-O-Lite chain. Including these additions, the Prest-O-Lite plants now number 38, located at industrial centers throughout the country, to supply the local demand for dissolved acetylene used in welding and cutting. Everett R. Kirkland is superintendent of the Phoenix plant, and Carl F. Chesak is superintendent of the El Paso plant. R. G. Daggett, whose headquarters are at the San Francisco office, is district superintendent.

Industrial Piping And the Oxwelded Joint

The increasing popularity of the oxwelded joint can be attributed to several decided advantages which it enjoys. Progressive construction engineers are recognizing it as the best modern practice on account of these salient features: Oxwelded joints are leakproof. Maintenance costs are practically nil. The oxwelded joint will last as long as the pipe itself. Costly cast fittings are eliminated: any special fitting can be fabricated with cutting and welding blowpipes right on the job. Cutting is made much easier and no threading is required. Pipe may be purchased in 40-foot lengths at a saving over the old method of buying many short lengths. Lighter pipe may often be used since properly made welded joints are 100 per cent efficient. A very neat job results when pipe is covered with lagging. Additions and changes to existing piping system may be made on short notice and at very little cost.

Simple and Efficient Vibrator Screen

The Universal Vibrating Screen Company is distributing a folder featuring the improved Type "G" screen and detail points of merit claimed for it.

Heavy pressed steel construction throughout gives strength and long service. Two point suspension of the vibrating frame with a shackle alignment provides uniform distribution of vibratory screening action. The vibrating mechanism consists of two off-center weights revolving at 1800 r.p.m. on oversize self-aligning ball bearings in dust-tight housings.

A twenty-four page catalogue describing these screens in detail with photos of actual installations and useful data will be gladly sent upon request.

New Bulletin Describes Duplex Air Compressors

The Pennsylvania Pump and Compressor Company has issued Bulletin No. 144 describing duplex air compressors, direct connected electric motor driven and belt driven in single stage and two stage types of compression.

A complete detailed description is given of each of the important mechanical features in the construction of Pennsylvania compressors, illustrated by particularly clear cuts.

Advantages of the synchronous motor drive, a feature of interest to users of air compressors, has been given space in the bulletin. Copies of Bulletin No. 144 may be had upon your request.

Crushing Rolls for Large Tonnage and Uniformity

The Traylor Engineering and Manufacturing Company has prepared for distribution a folder on the subject of crushing rolls.

The claims made for crushing rolls, are large tonnage, efficiency and economy in the preparation of aggregate of different sizes and uniformity of the product secured by this method of crushing. The function of the roll is not limited to fine reduction although more commonly used for this purpose and operators in various industries have not secured the advantages they might have.

Roll crushers are used by slag producers, breaking from twenty-four inches to sand in several stages, taking out commercial sizes along the bins; crushed stone operators use rolls for second stage crushing, as well as making "chips"; rock asphalt is reduced mostly with rolls; gravel companies make sand, and cement manufacturers crush clinkers for easier finishing.

Traylor Crushing Rolls are offered in four types and thirty sizes from a small laboratory machine 9 by 10 inches to the Four Rod Tension type 78 by 36 inches. The Traylor Engineering and Manufacturing Company has something of special interest to say to sand and gravel producers who are troubled with the problem of getting rid of pea gravel. Information and bulletins are available upon application.

Batchmeter for Batching By Volume or Weight

The Superior Engineering Company is sending out a folder illustrating the Superior Batchmeter.

The claim is made that this Batchmeter is designed for the building supply dealer and the quarryman and can be used on the side-discharge bin.

The batchmeter can be attached to the storage bin in the same manner as an ordinary loading gate. One man operates the complete outfit with ease and the accuracy of the batch is not dependent on his ability. The complete operation of the volume batchmeter is by means of one chain wheel which controls both the upper and lower gates which are interlocking.

The capacity can readily be changed from minimum to maximum capacity. It is adjustable from 10½ to 28 cubic feet.

Blue prints showing typical designs and description catalogues may be had upon request.

Excavating and Material Handling Equipment

Orton Crane and Shovel Company has for distribution Bulletin No. 60, a 32 page book, printed in color, descriptive of their cranes, shovels, draglines, skimmers and buckets.

The book describes and illustrates the detail of manufacture of its product and carries a large number of photographs of the various machines in operation: There are included also complete diagrams and charts of dimension, weights, capacities and operating ranges.

Pictorial History of an Interesting Small Machine

The Universal Crane Company has distributed a small sixteen page book printed in colors, containing pictures of installations of its one-half yard combination machine mounted on trucks, combination truck and crawler, and crawlers.

The illustrations show, not only the first machine of this type to be built but the later and more modern application of this one-half yard machine as cranes, clamshells, shovels, draglines, skimmers and backdiggers.

Industrial Tractor Power Units of Special Design

Bulletin B-20-A issued by the Brookville Locomotive Company describes industrial locomotives powered with McCormick-Deering (International Harvester Company of America) model 20 Industrial Tractor Power Units.

The Brookville locomotives are designed to meet the requirements of industrial haulage and construction work. They are made in five and six ton models, using 18 to 56½ inch gauge track.

The bulletin gives complete specifications covering both models and tables of hauling capacities. Detailed descriptions and illustrations are also given of the construction and operation of the vital parts of the power units.

All Steel Dump Bodies

The Superior Body Corporation has prepared for distribution a book describing and illustrating their line of all steel dump bodies.

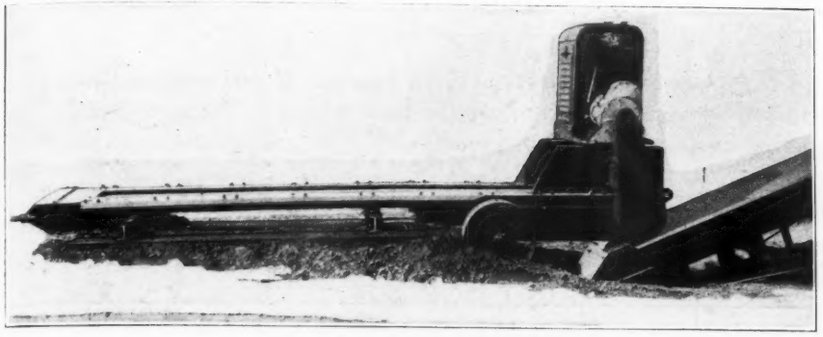
These steel dump bodies are of rigid construction heavily reinforced to insure maximum strength at points of greatest strain. The bodies are tapered to insure the complete release of load.

The body and sub-frame are a single unit, quickly and easily attached to the chassis of standard trucks.

The general specifications give full information in the various sizes and types of all steel dump bodies which are built by the Superior Body Corporation.

Ziegler Opens Office

The Wm. H. Ziegler Company is opening a branch office in Fargo, North Dakota. This office will be in charge of O. H. Strand, who has been with the Ziegler Company about three years. Mr. Strand will represent the accounts which the Minneapolis office handles, including a complete line of contractors' equipment, coal-handling machines, and all kinds of material-handling machines. Among the accounts are Barber-Greene, Bucyrus Erie, Chain Belt, Sterling Wheelbarrow, Williams Buckets, Plymouth Locomotives, and Butler Bins.



A New Belt Feeder

New Belt Feeder Announced

For unloading cars of all bulk material, the Barber-Greene Company announces the new B-G belt feeder. The purpose of the feeder is to facilitate the unloading of material such as sand, gravel, slag, crushed stone, coke, hard coal, cinders, iron oxide, fine ore, moulding sand and any other free flowing material usually transported in hopper-bottom cars.

The use of this machine will eliminate the necessity of constructing a pit under the railroad tracks, which is not only an expensive item, but is always necessary to secure permission of the railroad and furthermore the approval of the pit construction. A small pit on the outside of the railroad track for the conveyor hopper under the discharge end of the gravel feeder is all that is needed.

The use of this feeder will speed up the unloading of material from hopper-bottom cars. It will control the flow of the material within the capacity of the conveyor. It will protect the conveyor and especially the belt from overloading and damage, thus increasing the life of such equipment, according to the manufacturer.

The machine may be used either over the rail or under the rail as required. The maximum thickness through the feeder frame, including the top sliding plate, is 4 1/16 inches. Either an electric motor or a gasoline engine can be used to drive the feeder.

Two Improved Types of Clamshell Buckets

The Owen Bucket Company, well-known manufacturers of clamshell buckets is introducing two improved types—one an exceptionally capacious rehandling bucket—the Type "S" Owen—and the other an unusually strong heavy duty digging bucket—the Type "D" Owen.

The Type "S" rehandling bucket has been designed for maximum output when rehandling loose or compact materials. It is constructed on liberal lines and, due to its exceptional width and length when opened, it is efficient for cleaning up materials loaded to shallow depths distributed over large areas. It is recommended for unloading barges, flats, cars and for stock pile work. It is made in standard, heavy and special models to suit requirements. Some of the important exclusive Owen features include: one-piece steel crosshead; concentration of weight located on the centershaft which affords greater digging power; sealed centershaft bearings, keeping the grease in and the grit out, an advantage essential to low upkeep and operating costs; rigid shell construction with minimum number of parts; proper reinforcement and long life sheaves and cables due to exclusive method of mounting on the main counterweight.

The Type "D" heavy duty buckets are designed for extra heavy digging and handling or for any work that subjects the bucket to excessive and severe strains. They are of exceptionally strong construction throughout. Some of the exclusive features incorporated in Type "D" Buckets are: one-piece extra heavy renewable jaws, grit-proof lubricated bearings, concentration of weight low in the construction for greater digging power, and the Owen method of stopping the jaws at a fixed open position to absorb dropping shocks. They are made in Standard, Extra Heavy and Narrow models to suit every difficult digging problem. They are particularly efficient and durable for work in stiff clay, ore, broken rock, slag or shale, dredging coarse gravel or other materials that demand a bucket of unusual strength and wear-resistant qualities.

Small Material Handling Units Featured by Maker

The Universal Power Shovel Company has issued several booklets describing its machine, including the Wilford clamshell, the Wilford Trench Hoe, Model "B" Gas Shovel and Model "CF" gas shovel.

The Wilford Clamshell is suitable for handling coal and miscellaneous materials, handling a one-third yard bucket. It is strictly a one man job, speedy in operation and ruggedly constructed. Power is furnished by a Fordson tractor unit. The Wilford Trench Hoe is a combination of the Wilford machine with trench hoe boom attached, operating a three-eighth yard bucket. This Wilford machine may be equipped to operate as a clamshell, crane, dragline and trench hoe.

The model "B" gas shovel is essentially the same as the Wilford machine but is powered with an International power plant, four cylinder engine, 3¾ inch bore by 5 inch stroke. The traction is of crawler type track of rugged construction. The general construction is sufficiently rugged to withstand the duty imposed. It is three-quarter swing, handling a three-eighth yard bucket.

The model "CF" gas shovel is full revolving type handling a three-eighth yard bucket. It is powered with a model "V" Waukesha, four cylinder engine with 4 inch bore and five inch stroke developing 42 h.p. at 1400 r.p.m.

The design of this model is compact and in many instances special to meet the demands for efficient performance on a scale that meets the requirements of this particular field. Bulletin describing these machines may be had upon application.

New Skip Hoist Catalog

The Stephens-Adamson Manufacturing Company announces its new 24-page Skip Hoist Catalog. This attractive catalog is one of the most complete describing this type of equipment. Within its pages are contained the selection of sizes, features, classifications, tabular data, capacity schedules, typical installation, together with illustrative photos and engineering details of skip hoists.

This catalog also formally presents the S-A style "Sd" skip hoist machine which is manufactured in three standard sizes, each size furnished with a number of different arrangements with motors and gears to give the desired speeds and capacities.

Sizes, styles and capacities of buckets, automatic loading devices, semi-automatic and full-automatic controls and the determination of cable sizes are other important features described within its covers.

Rider Joins Penn

The H. O. Penn Machine Company, New York City, announces that M. B. Rider has joined its organization as manager of the Road Building Department.

Rates for display advertisements in the Broadcast Section are given below. If you want to buy or sell used equipment, if you want a job or need a man, advertise your wants in Pit and Quarry. Advertisement copy for publication in the next issue should reach our office within one week after the date of this issue.

RATES PER INSERTION	1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches	8 Inches	9 Inches	10 Inches	12 Inches	15 Inches	20 Inches	30 Inches
1 Insertion	$ 3.75	$ 7.25	$10.75	$14.25	$17.75	$ 21.25	$28.25	$31.75	$35.25	$42.25	$56.25	$70.25	$105.00
2 Insertions	3.75	7.25	10.70	14.20	17.65	21.15	28.15	31.65	35.15	42.15	56.15	70.00	104.00
3 Insertions	3.75	7.20	10.65	14.15	17.55	21.05	28.05	31.55	35.10	42.05	56.05	69.75	103.00
4 Insertions	3.70	7.15	10.60	14.10	17.45	20.95	27.95	31.45	35.00	41.95	55.90	68.75	101.00
8 Insertions	3.65	7.05	10.50	14.00	17.25	20.75	27.75	31.25	34.80	41.75	55.70	67.50	98.00
13 Insertions	3.60	6.95	10.40	13.90	17.05	20.55	27.55	31.05	34.60	41.55	55.55	66.25	94.00
26 Insertions	3.50	6.75	10.20	13.70	16.65	20.05	27.05	30.65	34.20	41.05	55.05	64.00	88.00

INFORMATION—"Broadcast" space is sold by the advertising "inch." Each page contains 30 inches. The width of the page is divided into 3 columns, each 2¼ inches wide. Each column contains 10 inches measured the length of the column. Any space may be used measured by the *even* inch in height (not fractions), by 1, 2 or 3 columns in width. The size of a space is its height in inches multiplied by the number of columns in width. Example: a space 3 inches high by 2 columns wide is 6 inches. Copy changes made without additional charge.

It Pays to Advertise in PIT AND QUARRY

"The results of our little advertisement in the two issues of PIT AND QUARRY were very satisfactory."
—Osakis Concrete Products Co.

Complete Service Publishing Company

538 South Clark Street CHICAGO

Machinery for Sale

SPECIALS
1—3-Roll Bradley Mill.
1—No. 6 Williams Universal Hammer Mill

CRUSHERS

Crushing Rolls

1—8″x5″, 4—24″x12″, 1—26″x15″, 1—30″x10″, 1—30″x16″, 2—36″x16″, 2—42″x16″, 1—54″x24″.

Gyratory

All sizes from No. 2 Reduction to No. 12K.

Jaw

1—2″x6″, 1—6″x3″, 2—8″x10″, 1—6″x15″, 2—9″x15″, 1—11″x22″, 2—12″x24″, 1—18″x36″, 1—42″x40″.

Rotary

Two No. 0, two No. 1, one No. 1½, and one No. 2 Sturtevant Rotary Fine Crushers.

Ring Roll

One No. 1 and one No. 2 Duplex Sturtevant ring roll mills.

Ball and Tube Mills

3′, 4′, 4½′, 5′, 5½′, 6′, 8′ Hardinge Mills and Tube Mills.

DRYERS

One 3′x30′, Three 4′x30′, One 4½′x30′, One 5′x40′, One 5½′x40′, One 6′x60′, One 7′x60′ and One 8′x80′ Direct Heat Rotary Dryers, One 5′x25′, One 6′x30′, Two 8′x80′ Ruggles Coles type "A" and One 5′x30′ indirect heat rotary dryer.

KILNS

3′x15′, 4½′x36′, 6′x60′, 6′x70′, 6′x100′, 6′x120′; 1—4½′ Bruckner Roasting Furnace.

MILLS

Two 33″ and two 42″ Fuller Lehigh Mills.
1 No. 0000, 1 No. 00, 2 No. 1, 2—4 Roll, and 1—5 Roll Raymond.
Swing Hammer Mills, Griffin Mills, Attrition and Cage Mills.
Air separators, Screens, Elevators and Conveyors, Sand Washers and Classifiers.

The Heineken Engineering Corp.
Industrial Engineers
117 Liberty St., New York City
Courtlandt 5130

CRANES

1—15-ton cap. LINK-BELT, K-42 GASOLINE Crawler, New 1927, 95 HP Waukesha Motor, 50 ft. Boom, 1-yd. C. S. Bucket, Excellent cond.
1—15-ton cap. NORTHWEST, Model No. 104, GASOLINE Crawler, New 1928, 7¼x9 Twin City Motor, 50 ft. Boom, Bucket operating, Like new.
1—15-ton cap. P. & H., Model No. 700, GASOLINE Crawler, New late 1927, 95 H. P. Waukesha Motor, 50′ Bm. Drag. attachment, almost new.

SHOVELS

1—LORAIN 75; GASOLINE crawler, New 1927, ALL STEEL CENTER DRIVE CRAWLERS; 1¼-yd. Dipper; HIGH LIFT; Like New.
1—ERIE B-2 DREADNAUGHT, Steam Crawler, Shop No. 3700, New 1926, ALL STEEL CRAWLERS; 1-yd., HIGH LIFT; Completely re-built, Like new.

GREY STEEL PRODUCTS COMPANY
111 Broadway New York City

1—Ingersoll-Rand "Leyner" No. 34 Drill Sharpener, complete with dies, dollies, etc.
1—Ingersoll-Rand Bit Punch complete.
1—Ingersoll-Rand No. 8 Pedestal Grinder.
1—Ingersoll-Rand No. 6-F Oil Furnace complete with No. 24A-56 Gravity Feed Steel Barrel Tank.

Above material was purchased new from the manufacturer and has been used less than six weeks.

BYRON W. GREENE JR. CO.
General Contractors
2605 Grand Central Terminal, New York

CRUSHERS
Traylor Jaw 36x42″ Mang. fitted.
Farrel Jaw 24x36″ Type 15-B.
Gates Gyratory, 12-K, 12-N.
McCully Gyratory No. 8, 5, 4, and 3.
Telsmith No. 4 and No. 2-F Reduction.
Kennedy gearless No. 37 Reduction.
Austin No. 10 and No. 5 gyratory.
Good Roads 10x20 portable & 10x20 on Skids.
Jaw Crushers, 7x15, 9x15, 12x24, 18x24.
Universal Jaw crusher 6x18.
Allis Chalmers Gates 7½-K and 6.
Symons Disc 48″, 36″ and 24″.
Sturtevant No. 1½ Rotary Fine Crusher.
Jeffrey Hammer Mill type A, 36x24″.
Raymond Mill No. 1.
Stephens-Adamson all Steel Bucket Elevator.
Caldwell Steel Bucket Elevator.
Stephens-Adamson Pan Conveyor.
Screens 48x20′, 48x16′, 40x12′.
Crushing Rolls various Sizes.
OTHER CRUSHERS, SCREENS AND CONVEYORS.

CRANES, SHOVELS AND DRAGS
Northwest 105 Combination ¾ yd.
Universal Power Shovel, Gas, Cat. ¼ yd.
Marion 270 Stripping Shovel.
Marion 31 Cat. 1¼ yd. low price.
Bucyrus Cl. 14 Cat. Dragline 80′ boom, 2 yd.
Bucyrus Cl. 24 Dragline electric 100′ Boom.
Speeder ½ yd. Gas. Cat. Shovel.
Byers Bearcat Crane 28′ Boom, low price.
Bucyrus 30-B Diesel Shovel and Dragline.
O. & S. Gas Cat. 50′ Boom 1 yd.
Osgood Steam Cat. ¾ yd. low price.
Byers Truck Crane 30′ Boom, ¾ yd.
Bucyrus Shovel 80-B Cat. 2yd.
Other makes and sizes on hand.
COMPRESSORS, CARS, LOCOMOTIVES, BOILERS AND POWER EQUIPMENT

F. MAYER, 53 W. Jackson Blvd., Chicago, Illinois

DERRICKS
2—35 ton Steel Guy 110′ Masts.
2—15 ton Timber. 70′ steel boom.
1—10 ton All-Steel Stiffleg, 75 ft. boom.
1—10 ton wooden stiffleg, 90 ft. boom, 3 line.
4—5 ton 50 and 60′ boom steel stiffleg.

HOISTING ENGINES
1—10x12 DD Lidgerwood Boiler Mounted
1—60 HP National 3-Drum Elec. with Swinger
2—30 HP Lidgerwood DD Elec.

GANTRY CRANES
2—Link-Belt Tower mounted, 90′ boom, steam operated full revolving Gantry cranes, mounted on 30′ towers

GASOLINE SHOVELS AND CRANES
1—1 cu. yd. Osgood Shovel.
1—1 cu. yd. Link Belt Combination
1—¾ cu. yd. Northwest Combination

STEAM SHOVELS
1—Marion 37 Cat. 1¾ yd. dipper
1—Marion 32 Cat. 1¼ yd. dipper

GASOLINE LOCOMOTIVES
1—8 ton Plymouth 36″ ga.
1—12 ton Whitcomb standard gauge.

AIR COMPRESSORS
1—599 cu. ft. Ingersoll Rand Short Belt Drive 104 HP 3 phase, 60 cy., 440 volt motor.
2—240 cu. ft. Penna. Motor Driven 40 HP 3 ph. 60 cy. 220/440 vs.
1—210 cu. ft. Chicago Pneumatic Portable Gasoline.

B. M. WEISS
1234 Widener Bldg., Philadelphia, Pa.